

# Railway Mechanical Engineer

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## November, 1932

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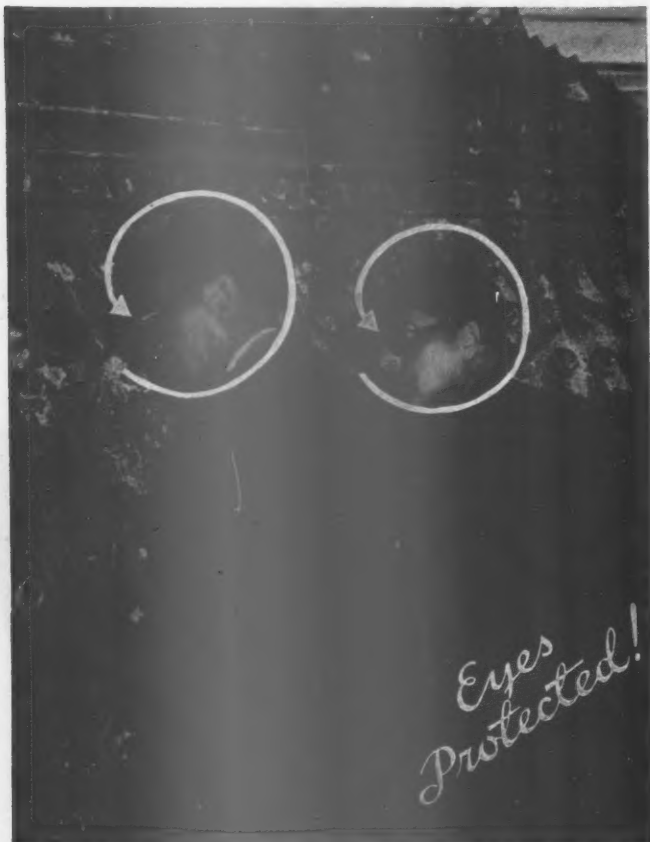
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# Railway Mechanical Engineer

Founded in 1832 as the American Rail-Road Journal

November - 1932

## Hopper Gondolas for the Kansas City Southern

**T**WENTY-five all-steel general-service hopper-bottom gondolas, of 70-ton nominal capacity, have recently been built by the Kansas City Southern at its main shops, Pittsburg, Kan. These cars include a number of novel features in design, particularly the use of one-piece cast steel underframes, and superstructures made of copper-bearing steel completely fabricated by electric welding. The purpose of this construction is to provide maximum corrosion-resisting qualities, long life and comparative freedom from maintenance expense in cars equally adapted to handling high-sulphur coal, coke, gravel, pipe, lumber, structural steel, etc. The wide adaptability of the cars to various loadings, as demonstrated by the performance of a number of cars in regular service since the middle of August, tends to reduce empty car mileage, thus affording an important advantage.

**One-piece cast steel underframes and welded superstructures are provided in twenty-five 70-ton cars—The welding procedure is described**

The cars are also notable for simplicity of design, fewer detail car parts, seams and joints and, consequently, lower fabrication costs, all of these advantages being obtained without any sacrifice of strength or penalty payment in the way of substantially increased weight. Stresses in all parts of the car are confined to commonly-accepted limits, and the somewhat greater weight of the cast steel underframe over equivalent fabricated steel construction is practically offset by the saving in weight



Kansas City Southern all-welded 70-ton hopper gondola car



due to welding the car superstructure. The provision of the underframe, hoppers, etc., in a single 18,000-lb. casting replaces 183 structural pieces and 2,250 rivets. The use of a welded superstructure also eliminates another 1,000 rivets. The only rivets in the car are those used in the application of safety appliances and hopper-door locks. The all-welded construction, using plates and standard rolled shapes, simplifies repairs and avoids the necessity of making expensive forming dies for side stakes and other pressings.

The general dimensions of the car are given in a

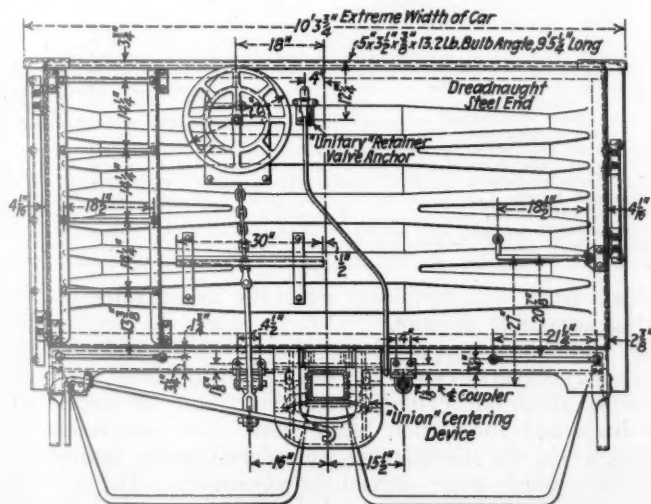
#### General Dimensions of K. C. S. All-Welded 70-Ton Hopper Car

Nominal load-carrying capacity .....	140,000 lb.
Light weight, approximate .....	53,000 lb.
Cubic capacity, level full .....	2,336 cu. ft.
Cubic capacity, heaped .....	2,690 cu. ft.
Length inside .....	45 ft.
Width inside .....	9 ft. 6 in.
Height inside .....	4 ft. 10½ in.
Length over striking plates .....	46 ft. 2 in.
Length over couplers .....	48 ft. 8 in.
Length truck centers .....	36 ft.
Width over all .....	10 ft. 3¾ in.
Height above rail .....	8 ft. 4¾ in.

table. It weighs approximately 53,000 lb., light, and, with a nominal load of 140,000 lb., weighs 193,000 lb. at the rail, or 17,000 lb. less than the permissible A.R.A. load limit at the rail. The car may, therefore, be loaded to 17,000 lb. above its nominal capacity, which could not be done if the light weight were excessive.

#### Why the Cast-Steel Underframe Was Used

The diversified nature of the commodities offered for shipment on the Kansas City Southern, particularly the

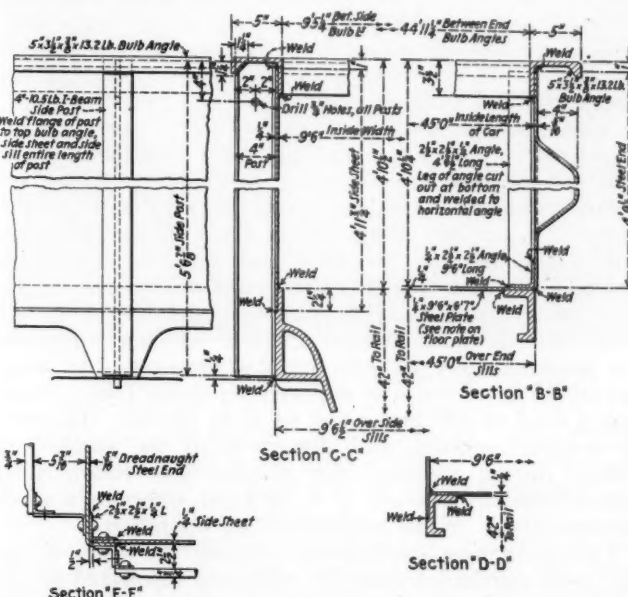


End elevation of the car

bituminous coal traffic in the Kansas, Missouri and Oklahoma fields, was an important factor in dictating the design of this car. Experience indicated that open-top cars of conventional fabricated steel construction are highly susceptible to oxidation and corrosion and, while the adoption of copper-bearing plates and shapes has

alleviated this trouble to some extent, it is impossible to overcome entirely the destructive action of steel-attracting acids released from wet coal and the resultant corrosion and high maintenance to rolled-steel plates and shapes. The corrosion-resisting qualities of cast steel, as demonstrated in locomotive tender frames and other locomotive and car parts over a period of many years, led to the conclusion that this material would be ideally suited for the underframes of hopper cars and other open-top cars.

The one-piece cast-steel underframe, with eight hoppers, body bolsters, striking castings and A.R.A. stand-



Construction details—Sections refer to the general drawing

ard draft-gear pockets cast integral, was accordingly designed and built for the K.C.S. car by the General Steel Castings Corporation. This underframe carries 11 downward projections on each side of the car for the application of side stakes. The bolster design provides for ample area of contact with the truck side bearings. The end hoppers are designed with wheel hoods, as shown in one of the illustrations, to allow ample clearance when the trucks are swivelling on curves under load. The four-wheel trucks are of the National Type B. with 6-in. by 11-in. journals. The spring arrangement and design of this truck are intended to provide progressively increasing capacity and non-harmonic dampened recoil. Specialties used on this car are shown in a table.

#### The Electric-Welded Car Superstructure

Electric welding was used in making the car superstructure, thus eliminating numerous seams and joints which provide recesses to harbor acid concentration and accelerate corrosion. In addition, such seams and joints as are necessary in the .20-per-cent copper-bearing



One-piece cast-steel underframe mounted on its trucks ready for application of the superstructure

rolled-steel superstructure are effectively sealed against the entrance of corrosion substances by welding. Realizing the vital importance of correct welding material and procedure in successfully and economically building all-welded cars, the first problem was the selection of suitable welding rods and the development of a practical method of assembling and welding the superstructure plates and shapes and securing them to the cast steel underframe. With respect to the welding rods, numerous laboratory tests were conducted with various shielded-arc and bare-electrode rods which conclusively proved this superiority of the shielded-arc rods for this work. These rods combine high tensile strength and ductility, are capable of much higher welding speeds and prove more resistant to corrosion, as demonstrated by accelerated corrosion tests made by submerging test specimens in dilute hydrochloric acid.

Various shielded-arc rods were found to possess about equal merit, but it was decided to use Hollup Corporation's No. 274 rod, purchased in  $\frac{1}{4}$ -in.,  $\frac{5}{32}$ -in. and  $\frac{1}{8}$ -in. diameters. The  $\frac{1}{4}$ -in. rod was used for approximately 90 per cent of the welds, the  $\frac{5}{32}$ -in. and  $\frac{1}{8}$ -in. rods being used for overhead and, to some extent, for horizontal work. An average speed of 36 ft. per hr. was attained on all fillet and butt joints, using both Westinghouse and General Electric welding units, set for approximately 40 volts and 250 amperes. An average of .16 lb. of rod was required per linear foot. There was a total of 850 linear feet of weld per car. In order to prevent buckling and distortion of the plates and shapes during welding, the practice was followed of tack-welding 2-in. beads at 8- to 10-in. intervals a short distance ahead of the major welding operation.

Copper-bearing steel plates, forming the sides of the car, were purchased from the mills and resquared to the exact dimensions before shipment. Three plates were used for each side, the lengths being such that each butt joint is located midway of one of the side stakes. Each side, including the plates, side stakes and top bulb-beam angle was completely assembled and welded prior to being applied to the underframe. To facilitate this operation and prevent distortion of the plates and shapes during welding, a special jig was constructed.

This jig was formed of three 12-in. channel-iron sections slightly longer than the side frame to be welded, all securely tied together by  $4\frac{1}{2}$ -in. tack-welded steel strips, with both sides of the jig parallel and at right angles to the end stop. One longitudinal edge of the jig was provided with  $1\frac{1}{2}$ -in. by 2-in. spacing angles welded to the channels with the 2-in. legs of the angles project-

ing up high enough to serve as a stop to the longitudinal edge of the steel plates forming the car sides. The intervals between the angles accurately spaced one end of each 4-in. I-beam used as a side post. The posts were then squared and a 5-in. by  $3\frac{1}{2}$ -in. by  $\frac{3}{8}$ -in. bulb angle applied and firmly clamped in place. The entire jig, being carefully levelled and mounted on four shop push cars, was moved under the overhead traveling crane for the assembly of the sides. It was then pushed back in one of the bays for the welding operation and, after completion of the welding, was again moved into the crane bay, where the completed car side was lifted from the jig. All welded joints were made at the locations shown in the drawing.

The cast steel underframes, when received, were unloaded in the steel car shop by an overhead traveling crane, and placed up side down on push cars. All under-

#### List of Car Parts Replaced by the One-Piece Cast-Steel Underframe

Names of parts	Number of parts
12-in. A.R.A. center sills	2
10-in. channel side sills	2
Body center fillers, cast-steel	2
Striking castings, cast-steel	2
Side-bearing reinforcing castings bolster cast steel	4
Side-bearings castings wearing plate filler cast steel	4
End-sill angles	2
Cylinder support channel	1
Draft-gear guides	4
Bolster tie plates	2
Bolster cover plates	2
Crossbearer tie plates	4
Crossbearer cover plates	4
Jacking plates	4
Diaphragm and side-sill connections	12
Center-sill cover plate	1
Diagonal brace and end-sill fillers	4
Floor board straps at bolster	8
Bolster and side-sill connections	4
Cylinder channel brackets	4
Reservoir strap	1
Cylinder strap	1
Floating lever fulcrum	1
Transom post to side sills	4
Bolster diaphragms	8
Cross-bearer diaphragms	8
Cross-tie diaphragms	4
Center-sill separators at cross bearer	4
Center-sill separators at cross tie	2
Push pole pockets	4
Diagonal braces	4
Rivets, 593 pounds	93
Floor boards	2
Body center plates, drop-forged	2

neath work was completed while the underframe was in this accessible position. This included the application of cast steel hopper doors, hopper-door locks, draft gears, couplers, centering device, uncoupling arrangement, air-brake cylinder, reservoir and all pipe and fittings and foundation brake gear. On completion of this work, the underframe was placed on its permanent trucks, which were previously assembled. The welded car sides were then placed in position by the overhead traveling crane. While thus held in position, the sides were squared and C-clamps applied which firmly held the sides while the welds tying the sides to the underframe were made. It will be observed from the drawing that this comprised two lines of welding to the underframe, one inside and one outside of the plates at the bottom. The posts were carefully welded along three edges at the bottom to give a secure attachment to the underframe. The pressed-steel ends, with top bulb angles welded in place, were then swung into position, squared, clamped and welded to the angle-iron corner posts, after which the top corner bands were welded in position. Safety appliances were put on, using rivets in accordance with the I. C. C. requirements. Hopper doors were provided with rivetted door locks for easy replacement at outlying terminals in case of breakage. The application of hand brakes completed the assembly.

The cars were painted inside and out, a rust-inhibitive primer coat being first applied. The underframe and



Jig used in assembling and welding the car sides

the trucks were then painted with Texaco No. 1076 car cement, the interior and exterior of the body being painted with rapid-dry black, the stenciling with white lead.

### Sample Car Withstands Rigid Tests

The first sample car, No. 29000, built to the new K. C. S. 70-ton hopper-bottom design, were subjected to severe tests. In deflection tests, a gaging wire was

### Special Materials Used in the Construction of the K. C. S. 70-Ton Hopper Car

One-piece, cast-steel underframe with eight hoppers cast integral	General Steel Castings Corporation
Hopper doors—Ajax cast-steel	Union Metal Products Company
Hopper-door locks	Wine Railway Appliance Company
Couplers—A.R.A. Type-E, bottom-operated, swivel-butt	National Malleable & Steel Castings Company
Coupler yokes—Cast-steel, swivel-butt	National Malleable & Steel Castings Company
Coupler centering device	Union Metal Products Company
Uncoupling device	Union Metal Products Company
Draft gear—Miner A-22-X-B	W. H. Miner, Inc.
Steel ends, Dreadnaught	Union Metal Products Company
Air-brakes—Schedule KD—10 inches by 12 inches	Westinghouse Air Brake Company
Brake beams, Huntoon No. 2 plus	Chicago Railway Equipment Company
Trucks—National Type-B, 6 inches by 11 inches, with progressive capacity, non-harmonic, dampened-recoil spring arrangement	National Malleable & Steel Castings Company
Single-plate bracketed chilled-iron wheels, 850 pounds	Griffin Wheel Company
Side bearings—Double-roller type	Wine Railway Appliance Company
Hand brakes	Ajax Hand Brake Company
Brake steps—Safety tread	T-Z Railway Equipment Company
Retaining-valve bracket—Ureco	Western Railway Equipment Company

strung on each side of the car, parallel to the machined surface of the side sills, the ends terminating at and being secured to the side stakes at the center line of the bolsters. A base line was scribed on the side stake at the center of the car and measurements taken from this point to the gage wire. The deflection at the center of the light car was 1/16 in. scant; loaded with sand levelled to the nominal capacity of 140,000 lb., the deflection was 3/16 in.; loaded with sand levelled to the



Welding a car side as assembled on the jig

load limit of 156,700 lb., it was 7/32 in.; with 156,700 lb. of sand heaped at the center, 30 in. above the sides and 12 ft. long, it was 9/32 in. The deflection was uniform at both sides of the car.

After completing the deflection tests, the load of sand (156,700 lb.) was again levelled off and the car moved to the yards for the buffing test. A string of seven 80,000-lb. capacity, 27000-series K. C. S. cars loaded with coal, with hand brakes set, were used against which to drop the car. The knuckles on both the first string car and car No. 29000 were closed; a distance of 100 ft. was marked off and the speed of the car determined by a stop watch over this distance.

Three impact tests were made at speeds of approximately 5, 7 and 12 m.p.h. On the third impact, the coupler on the 27000 series car was broken, and the side sills sprung. Coal in five of the seven cars in the string was shifted. The sand in car No. 29000 shifted from  
(Concluded on page 449)



Completed car side ready for welding to the one-piece cast-steel underframe

# Multi-Pressure Locomotive On the Canadian Pacific

## Part I

**R**EPORTS on various features of the design and also on the operating performance of the Canadian Pacific multi-pressure locomotive No. 8000 were sponsored by the Railroad Division of the American Society of Mechanical Engineers at its spring meeting which was held June 27 to July 1, 1932, inclusive, at Bigwin, Ont. Three reports were presented by H. B. Bowen, chief of motive power and rolling stock, Canadian Pacific; J. B. Ennis, vice-president, American Locomotive Company, and F. A. Schaff, president, The Superheater Company. C. E. Brooks, chief of motive power and car equipment, Canadian National, presided at the meeting.

At the present time there are five locomotives of multi-pressure design which have been built for service in Europe and North America. The two locomotives on this continent are the No. 8000, 2-10-4 type on the Canadian Pacific, and the New York Central No. 800, 4-8-4 type. Both of these locomotives are equipped with what is known as Elesco boilers. The C. P. R. locomotive was placed in service the latter part of May of last year. The second locomotive to be equipped with the Elesco boiler was delivered to the New York Central from the Schenectady, N. Y., plant of the American Locomotive Works the latter part of 1931. Both locomotives were designed through the co-operative efforts of the American Locomotive Company, the Superheater Company, and the mechanical departments of the respective railroads.

As was pointed out by various speakers at the Bigwin meeting, both locomotives follow the same general scheme of design with respect to the construction of the boilers and fireboxes. The essential differences pertain largely to the frames and running gear because of the differences in wheel arrangement. The New York Central locomotive No. 800, which has been designated Class H8-1a, burns soft coal, while the Canadian Pacific, assigned Class T4a, burns oil.

The C. P. R. No. 8000, Class T42, was built for comparison with the road's Class T1a locomotives, which have the same wheel arrangement. A report of some of the results of the comparative tests is included in Mr. Bowen's paper. The following is an abstract of the paper

**Railroad Division, A. S. M. E., discusses developments in the use of high steam pressures in locomotives—H. B. Bowen, F. A. Schaff and J. B. Ennis present papers on the design and performance of the C. P. R. locomotive No. 8000 equipped with the Elesco boiler**

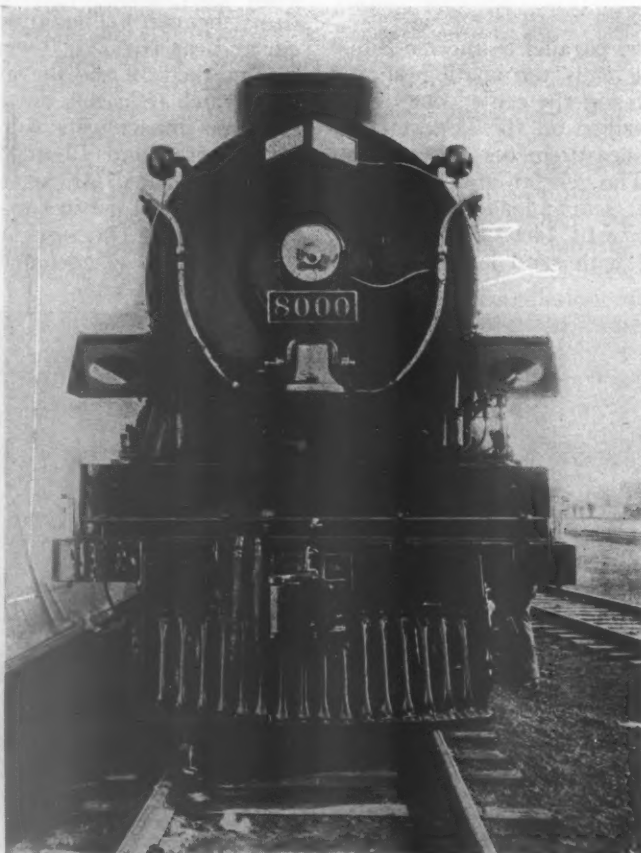
presented at the Bigwin meeting by Mr. Schaff, which describes the steam generating system of the Canadian Pacific locomotive.

### Mr. Schaff's Paper

The development of steam generation has been characterized by a steady trend towards higher steam pressures. At the beginning of the century, locomotive boiler pressures had risen to 180 lb. or 190 lb. from 150 lb. or 160 lb., which had been considered high pressures during the preceding decade. By 1910, 200 lb. was generally regarded as the limit for simple-expansion locomotives, although during the compound era 215 and 225 lb. had been used to some extent.

With the introduction of superheated steam there was a lull in the advance of pressures, as the advantages gained by the use of superheat were adequate to meet the then requirements of added capacity and fuel economy. In more recent years the insistent demands for greater economy and higher sustained locomotive capacity with heavier loads and faster schedules caused designers again to increase the working steam pressure and also to provide for higher steam temperatures.

The locomotive boiler in all its major features has changed but little, save in size. It is true that proportions have been changed and many devices have been added which have materially increased the efficiency, but in the main the boiler is as it was a century ago. Brotan in Europe and others, following in his wake, built



The C. P. R. multi-pressure locomotive

water-tube fireboxes to better provide for higher working pressures. This trend evidenced itself in America through the introduction of the Jacobs-Schupert firebox on the Atchison, Topeka & Santa Fe, the Baldwin Locomotive No. 60000, the McClellan firebox on the New York, New Haven & Hartford and, more recently, the water-tube fireboxes on the Delaware & Hudson. The Gresley-Yarrow water-tube boiler on the London & North Eastern, in England, and the Winterthur locomotive, in Switzerland, represent constructions which aimed at suitability for higher working steam pressures.

With the present state of the art it is generally considered that the conventional type of locomotive boiler with stayed surfaces is not suitable for pressures above approximately 300 lb. per sq. in. It is essential therefore to utilize some sort of water-tube construction for pressures materially higher than this figure.

#### The Elesco Multi-Pressure System—The Closed Circuit

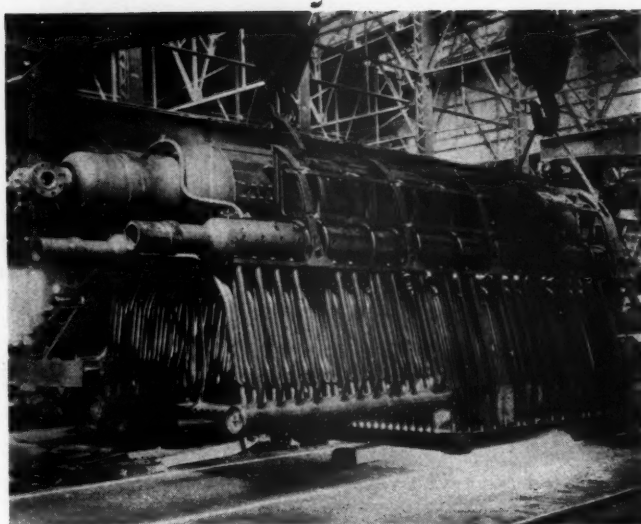
The Elesco multi-pressure system as used on the Canadian Pacific No. 8000 seems to adequately meet not only the requirements for substantially high pressure, but offers corollary advantages contributing to ease of maintenance.

The system consists of three separate units: The closed circuit, the high-pressure boiler, and the low-pressure boiler.

Referring to the illustration showing the construction of the firebox and closed circuits, the bifurcated seamless steel tubes are 2 in. and 2½ in. outside diameter. The front view shows that the furnace walls are formed by one straight riser tube and one bent crossover tube changing alternately.

The tube ends are rolled into the firebox ring at the bottom and at the top into the steam separator drums. A special feature of the boiler is that the down-comer tubes are not located within the gas path but outside of the wall of riser tubes, thus insuring a positive water circulation without the dangerous reversals of flow encountered on some designs of water-tube boilers. The tube system is filled to approximately the center of the steam separator drums with distilled water, which serves as a heat carrier.

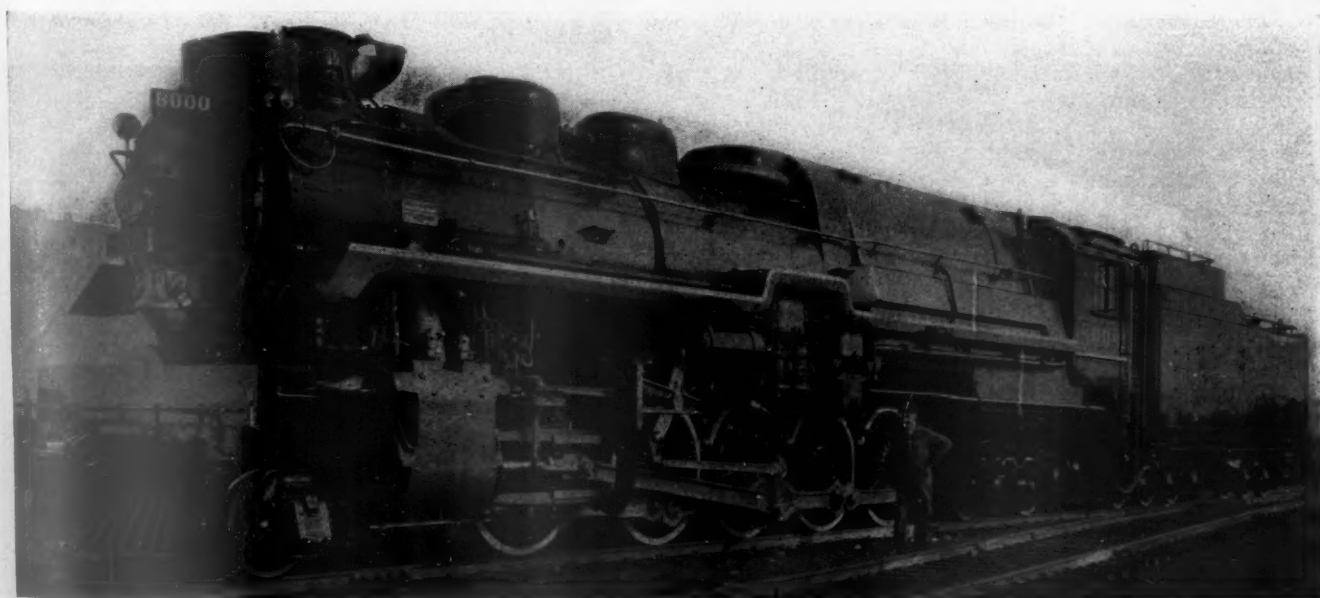
The steam generated is taken from the steam space



Front view of the left side of the closed circuit and high-pressure boiler

of the separator drums and carried by short riser pipes to the heat-transfer elements located in the main steam drum on top of the firebox. During its flow through these elements the steam, by losing its latent heat to the lower-temperature feed water of the high-pressure boiler condenses, thus generating indirectly the high-pressure live steam used in the high-pressure cylinder. The condensate flows out of the lower part of the heat transfer elements through the down-comers or condensate tubes to the water collectors at the bottom of the firebox and combustion chamber. There it again enters the riser tubes, thus completing the circuit. As distilled water is used and the system is sealed, no scale can be formed in the water tubes which are in contact with the fire.

This is probably the outstanding feature of this design as one of the principal difficulties with water-tube construction in locomotive boilers has been the necessity for careful and frequent cleaning of the tubes to avoid accumulation of scale. This cleaning is a slow and expensive operation requiring the locomotive to be out of service a considerable portion of the time. With



Canadian Pacific double-pressure locomotive built at its Angus shops with the co-operation of the American Locomotive Company and the Superheater Company

the indirect system as used on the No. 8000, the water tubes will never require cleaning. Thus, aside from the time and labor saved, there is the further advantage of avoiding the breaking and remaking of numerous high-pressure joints at the washout plugs, etc.

The flow of water and steam in the system is a natural circulation depending upon the hydraulic head

required temperature differential is obtained and the heat flow from the closed-circuit steam to the high-pressure boiler water produces and maintains the 850-lb. pressure in the high-pressure boiler. The two safety valves of the closed circuit are set at a pressure of 1,700 lb. per sq. in., in order that there shall be an adequate range which will preclude the loss of water.

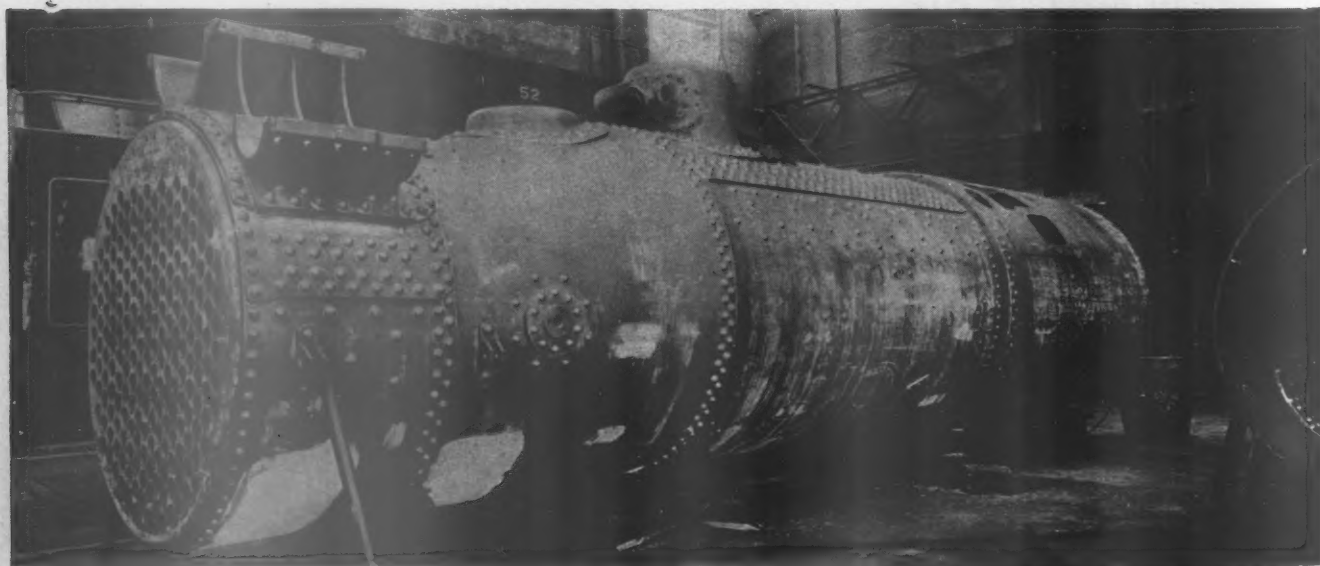
	C.P.R.	N.Y.C.	P.L.M.	L.M. & S.	G.St.
Road					
Boiler pressures:					
Closed circuit .....	1300-1700 lb.	1300-1700 lb.	1300-1560 lb.	1300-1700 lb.	1300-1700 lb.
High-pressure boiler .....	850 lb.	850 lb.	850 lb.	900 lb.	850 lb.
Low-pressure boiler.....	250 lb.	250 lb.	200 lb.	250 lb.	200 lb.
Firebox:					
Grate area .....	77 sq. ft.	65 sq. ft.	41.8 sq. ft.	28 sq. ft.	26.6 sq. ft.
Volume .....	353 cu. ft.	318 cu. ft.	236 cu. ft.	175 cu. ft.	212 cu. ft.
Fuel .....	Oil	Bit.	Bit.	Coal	Bit.
Heating surfaces:					
Closed circuit.....	520 sq. ft.	430 sq. ft.	322 sq. ft.	200 sq. ft.	218 sq. ft.
Low-pressure boiler.....	3,746 sq. ft.	3,229 sq. ft.	1,830 sq. ft.	1,335 sq. ft.	1,370 sq. ft.
Total evaporating.....	4,266 sq. ft.	3,659 sq. ft.	2,152 sq. ft.	1,535 sq. ft.	1,588 sq. ft.
High-pressure superheater.....	941 sq. ft.	835 sq. ft.	400 sq. ft.	285 sq. ft.	323 sq. ft.
Low-pressure superheater.....	1,102 sq. ft.	1,070 sq. ft.	415 sq. ft.	385 sq. ft.	320 sq. ft.
Total superheater.....	2,043 sq. ft.	1,905 sq. ft.	815 sq. ft.	670 sq. ft.	643 sq. ft.
Total combined.....	6,309 sq. ft.	5,564 sq. ft.	2,967 sq. ft.	2,205 sq. ft.	2,231 sq. ft.
Heat-transfer coils, inside.....	750 sq. ft.	660 sq. ft.	460 sq. ft.	295 sq. ft.	315 sq. ft.
Boiler dimensions:					
Low-pressure boiler, inside dia.....	82 in.	80 in.	63¾ in.	66½ in.	61¾ in.
Low-pressure boiler, length over tube sheets.....	19 ft. 1¾ in.	18 ft. 2½ in.	16 ft. 3 in.	13 ft. 2½ in.	13 ft. 10¾ in.
Low-pressure boiler, no. of flues.....	214	194	132	130	116
Low-pressure boiler, diam. of flues.....	3½ in.	3½ in.	3¼ in.	3 in.	3¼ in.
High-pressure boiler, inside diam.....	39 in.	39 in.	37¾ in.	36 in.	36 in.
High-pressure boiler, length overall.....	25 ft. 2 in.	23 ft. 9½ in.	20 ft. 4¾ in.	14 ft. 11 in.	16 ft. 11 in.
Steam separator drums, inside diam.....	12 in.	12 in.	10½ in.	10½ in.	11 in.
Combustion chamber drums, inside diam.....	7¼ in.	7¼ in.	3 in.	3¼ in.	3¼ in.
Closed circuit tubes, outside diam.....	2 and 2½ in.	2 and 2½ in.	2 in.	2 in.	3 in.
No. of superheater units—H.P.....	49	44	32	24	30
L.P.....	61	55	66	32	56
Superheater tubes, outside diam.....	1 3/16 in.	1 3/16 in.	15/16 in.	1 in.	15/16 in.
Water content:					
Closed circuit.....	2,660 lb.	2,360 lb.	.....	1,250 lb.	1,360 lb.
High-pressure boiler.....	5,180 lb.	4,665 lb.	4,000 lb.	2,500 lb.	3,150 lb.
Low-pressure boiler.....	16,500 lb.	16,750 lb.	8,900 lb.	6,775 lb.	7,500 lb.
Ratios:					
Closed circuit heat, sur. + grate area.....	6.75	6.62	7.7	7.15	8.2
Total evap. sur. + grate area.....	55.4	56.2	51.4	54.8	59.7
Total heating sur. + grate area.....	82.0	85.7	70.9	78.8	83.8
Closed circuit heat, sur. + total evap. heat, sur.....	12.2	11.3	15.0	13.0	13.7
Heat trans. coil heat, sur. + closed cir. heat, sur.....	1.44	1.61	1.43	1.48	1.45
High-press. sup'h'r. sur + closed cir. heat, sur.....	1.81	2.03	1.24	1.43	1.48
Low-press. sup'h'r. heat, sur. + low-press. heat, sur.....	.295	.33	.227	.288	.233

of the liquid and unassisted by mechanical means. There is no fixed steam pressure in the closed circuit but it depends on the steam output of the locomotive. Under normal conditions the boiler carries about 1,350 lb. per sq. in., and under peak loads it may rise to 1,600 lb.

The pressure in the closed circuit is such that the

## The High-and Low-Pressure Boilers

The two illustrations referred to also make clear the arrangement of the high-pressure boiler. The high-pressure steam of 850 lb. per sq. in. is generated in a seamless forged nickel-steel drum 39 in. in inside diameter, which is located above the closed circuit and protected from contact with flames and firebox temper-



Right side of the low-pressure boiler

atures by the cross-over tubes of the closed circuit, by a plate of heat-resisting steel and by lagging. The high-pressure steam is generated indirectly by means of the heat-transfer elements in the boiler drum. The average water level in the drum is about 7 in. above the center line, so that from 80 to 90 per cent of the elements are covered by water. The steam flows through two dry pipes located at the highest part of the boiler and perforated at their upper circumference. They emerge as one pipe at the front end of the drum, lead to a shut-off valve and from there to the high-pressure superheater header in the smokebox of the locomotive.

One of the illustrations shows the third part of the system, the low-pressure boiler which carries 250 lb. per sq. in. pressure. It is similar to the barrel part of

serves partly as an evaporator for the low-pressure steam and partly as an economizer for the high-pressure boiler.

The high-pressure feedwater is drawn by the high-pressure feed pump from the low-pressure boiler at approximately 250 lb. pressure and 400 deg. F. temperature, and delivered to the high-pressure boiler drum. Besides using the less expensive and lighter heating surfaces of the low-pressure boiler for preheating the high-pressure feedwater, this procedure has the advantage that most of the scaling matter remains in the low-pressure boiler where it can be easily cleaned out. Only a small amount of foreign matter is carried over into the high-pressure drum. Inasmuch as the high-pressure drum is not exposed to flame, any foreign

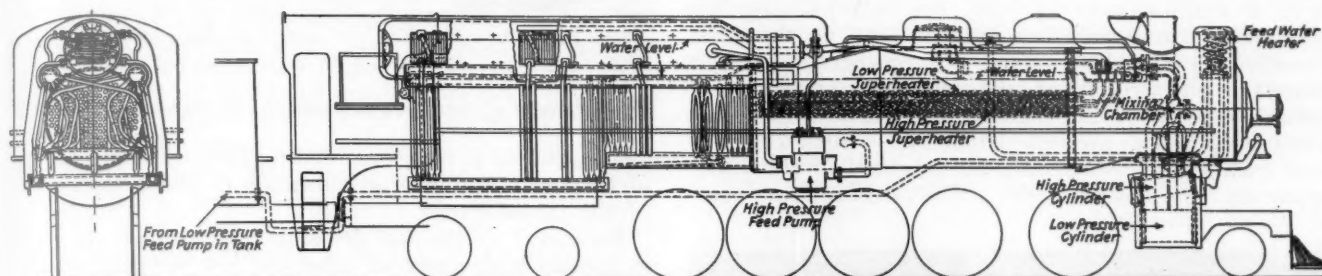


Chart showing the steam and water flow of the Elesco boiler as installed on C. P. R. locomotive No. 8000

an ordinary boiler with a circular rear flue sheet riveted to the boiler shell instead of to the firebox. The boiler is fitted with 3½-in. outside diameter flues containing a 1 3/16 in. outside-diameter superheater unit of the Type E. design. The units are divided into two groups near the vertical center line, those on the right-hand side comprising the high-pressure superheater and those on the left-hand side forming the low-pressure superheater. Both superheaters are made of the same material and corresponding units have like dimensions. Maximum interchangeability is therefore provided.

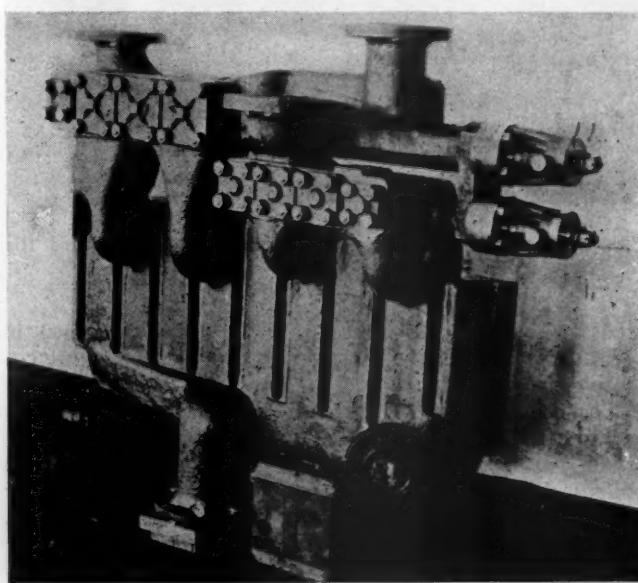
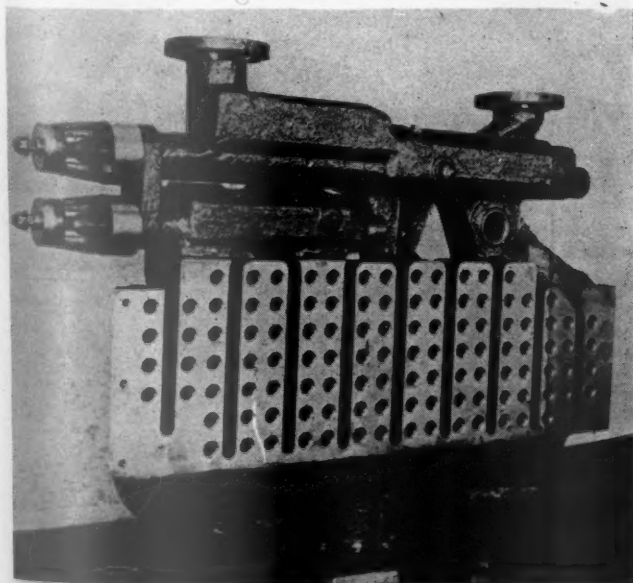
#### Water and Steam Flow in the Boiler

Ordinary feed water is drawn from the tender tank by a standard feed pump, and forced through the exhaust-steam feedwater heater in front of the stack, to the low-pressure boiler which it enters at a temperature of from 200 to 220 deg. F. The low-pressure boiler

matter which may be deposited in the drums or on the heat transfer elements is of a soft nature and can be readily washed off through the clean-out holes provided along the top of the drum.

The steam generated in the high-pressure boiler at 850 lb. pressure, flows through the outside dry pipe to the superheater header in the smokebox, then through the units of the Type E superheater and through the multiple throttle to the high-pressure cylinder located between the frames underneath the smokebox. Steam from the low-pressure boiler at 250 lb. pressure passes through a tangential dryer and a conventional dry pipe to a low-pressure superheater header in the smokebox. From there it passes through the low-pressure Type E superheater to the multiple-valve throttle, then to two mixing chambers located in the smokebox.

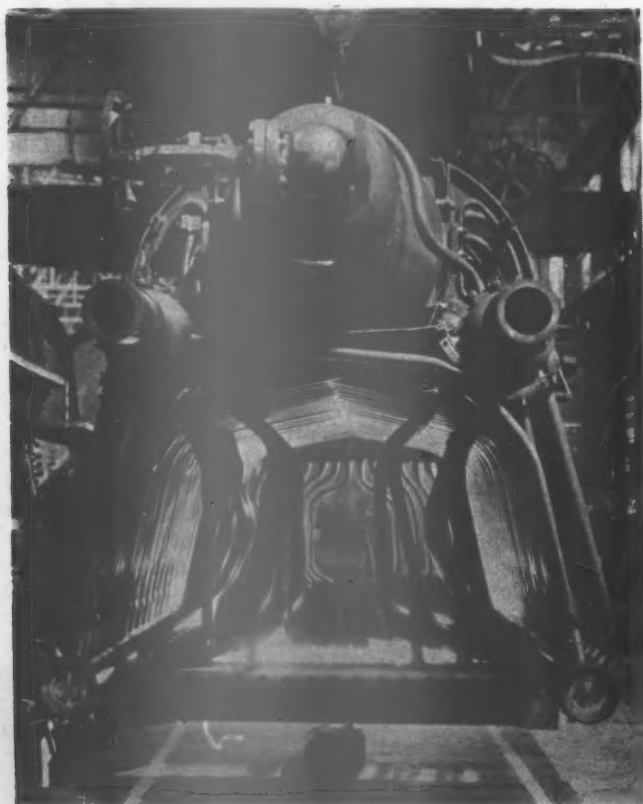
These mixing chambers are formed by increasing the diameter of each low-pressure steam pipe. The



Combined high- and low-pressure superheater header—Left, bottom view; right, top view

low-pressure live steam is mixed with the high-pressure exhaust steam by means of a perforated nozzle located in this chamber and piped to the high-pressure steam chest. The mixture flows to the two outside low-pressure cylinders. By this means the high-pressure exhaust steam is reheated in a simple manner and the difficult problem of oil separation, so vital for all types of separate reheaters, is avoided. The exhaust from the low-pressure cylinders is utilized in the usual way for drafting the engine and preheating the low-pressure feed water.

The high-pressure and low-pressure superheater headers are of the Type E through-bolt design. They are separate, but cast integral. Each header is fitted with a multiple-valve throttle, the high-pressure and the low-pressure differing only insofar as the high-pressure throttle has valves of considerably smaller diameter on account of the increased pressure and greater density of the high-pressure steam. The two throttle camshafts are linked together in such a manner that each low-pressure valve opens ahead of the corresponding high-pressure valve. The camshafts are oper-



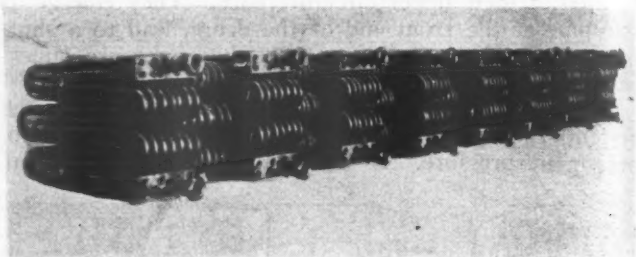
Closed circuit and high-pressure boiler, looking toward the rear

ated by one throttle lever in the cab and the throttle operation is exactly the same as with a normal locomotive.

The boiler heating surfaces and the cylinder sizes and cutoffs are so calculated that full pressure is maintained in both the high-pressure and low-pressure boilers during operation. To prevent opening of the high-pressure safety valves when the throttle is closed, and for accelerating the steaming of the low-pressure boiler at firing up, a crossover line is arranged which allows superheated high-pressure steam to be passed into the low-pressure boiler. Flow of steam through this line is controlled by a cone-seated valve.

### Design Provides Many Safety Features

There are three water gages on the boiler. The one for the closed circuit is placed outside of the cab, to be observed only at the beginning and end of each run to ascertain that no water has been lost in service. During the run the system is controlled indirectly by two



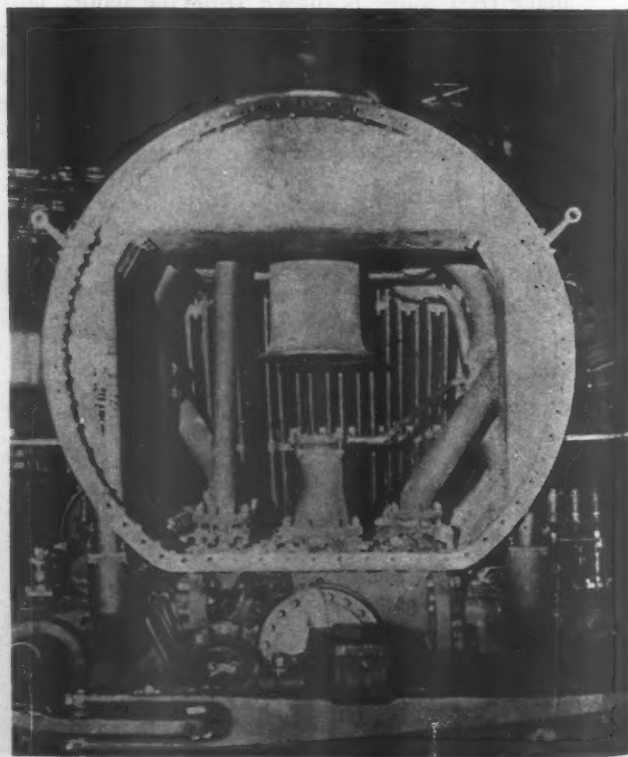
Heat-transfer elements as enclosed in the high-pressure drum

thermo-couple pyrometers, which show the temperature of the steam and give an indication of the performance of the closed circuit.

Inasmuch as the low-pressure boiler tubes are only in contact with gases of relatively low temperature together with the absence of the crown sheet of the normal type of boiler, the safety of the design is apparent.

The water in the tubes forming the firebox and combustion chamber is scale free. Overheating of tubes due to scale formation, a quite common failure on ordinary high-pressure boilers, is, therefore, entirely eliminated.

An additional safety factor is the relatively low energy stored in the multi-pressure boiler, in spite of the higher steam pressures. All three units together contain only approximately 70 per cent of the B.t.u. found in a normal-pressure locomotive of equal capacity. The separation of the boiler into three units increases the safety still further, as all three units are not likely to be damaged at the same time. In case of a failure of



Smoke box of C. P. R. locomotive No. 8000

a water tube in the closed circuit due to faulty material or leakage, the energy of the escaping steam will be only about 15 to 20 per cent of that liberated by a corresponding failure on a standard type boiler. As considerable care has been taken to prevent steam from entering the cab in case of a tube rupture, the damage, therefore, will certainly be negligible, compared with a crown-sheet or arch-tube failure, in an ordinary locomotive.

The engine is expected to be more economical than the present type of locomotive. The savings are derived from the higher working capacity of the high-pressure steam which can be generated even at a slightly lower expense of fuel than normal-pressure steam since for 1 lb. of steam at 250-lb. pressure, 1,201 B.t.u. are required, against only 1,195 B.t.u. at 850-lb. pressure. Furthermore, the boiler is designed for steam temperatures at the superheater headers of about 750 deg. F. which also contributes to the increased economy.

One of the tables shows some of the characteristic dimensions of five locomotives of this type. Three of these are for fast passenger service. The New York Central locomotive is designed for fast freight operation and the Canadian Pacific engine is specifically intended for heavy grade work.

The Canadian Pacific locomotive No. 8000 is the largest of the five locomotives which have thus far been constructed, and in which the multi-pressure indirect steam-generating system has been employed.

(Abstracts of the papers presented at the Bigwin meeting by Mr. Ennis and Mr. Bowen will appear in the next issue of the *Railway Mechanical Engineer*.—EDITOR.)

## Hopper Gondolas for the Kansas City Southern

(Continued from page 443)

level to one end of the car. Under this severe test, car No. 29000 was not damaged in any way. The coupler horn did not come in contact with the striking pad on the end sill. The steel ends and sides were not distorted in any way; welded seams showed no indication of rupture; side-sill deflection decreased approximately 1/32 in., due to the shifting of the load. The hopper doors were not sprung and the Wine locks held them securely fastened.

Following the buffing tests, the car was moved around the freight-house lead (Pittsburg), a 20-deg. curve, and no difficulty was experienced. The clearances were as follows: Hopper to wheel flange, horizontal minimum, 3 1/2 in.; hopper to wheel flange, vertical minimum, 2 3/4 in.; truck sides clear wheel rim, 1 1/4 in.; brake hangers clear truck sides, 5/8 in.; all other clearances O. K.

Sand was then removed from the car and it was reloaded with company coal, including a 12-in. center heap. The weight at the rail was 194,700 lb., net load 141,500 lb., or 1,500 lb. over the nominal capacity of 70 tons. The car was billed to Port Arthur, Texas, June 18, and, completing the round trip, returned to Pittsburg on June 27. During the trip, the car was in a number of heavy rains, with the result that the lading accumulated considerable weight, as shown by the following scale weights: Gross weight loaded car as returned from Port Arthur, 197,100 lb.; net weight, 143,800 lb.; net weight original coal load, 141,500 lb.; accumulated moisture, 2,300 lb.

## Car Shows 85 Per Cent Self-Clearing Capacity

The car was then spotted on the coal tippie, and dumped, after which it was reweighed to determine the per cent of self-clearing capacity, based on the amount of fuel still remaining in the car. It was found that the self-clearing capacity was approximately 85 per cent, based on actual weights.

A recheck for deflection with the car under load, as returned from Port Arthur, showed the deflection to be 3/16 in.; furthermore, a recheck of the light car showed no permanent set, the deflection being the same as when the car was released from the shop, or a scant 1/16 in. A close examination did not disclose any indication of bulging either of the sides or the ends. The car was square and all welded seams were in satisfactory condition. A hand-brake stop test was made with the loaded car (197,100 lb. at rail) from a speed of approximately 15 m.p.h. The car was stopped in a distance of 360 ft. in 32 sec. on a descending .39 per cent grade, all parts of the brake gear functioning satisfactorily.

Subsequent tests of the cars, some of which have now been in service over two months, have failed to develop any weaknesses, and one surprising observation has been the unexpected durability of the interior coat of paint after several coal loadings. On one occasion, a car of this series was cornered and the corner band split, but no distortion of the sheets or posts took place and none of the welds gave indication of failure.

## Thermo-Gravity System Of Air-Conditioning

A SYSTEM of air-conditioning known as the Thermo-Gravity system and which uses water-ice as its cooling medium has been developed by the American Car & Foundry Company, 30 Church street, New York. It has been designed to cool, wash and dehumidify the air during warm weather and to heat, wash and humidify the air in cold weather, automatically under thermostatic control. The basic principles embodied in the design of this system are, first, that the apparatus be relatively inexpensive; second, that it can be applied to existing cars with minimum disturbance of car parts; third, that no appreciable increased electrical energy be required, and, fourth, that the system be efficient, yet fool-proof.

The air-conditioning equipment consists of an ice-storage compartment and a conditioning unit which is provided with fan blowers, washing and cooling units. Three motors are required for the necessary power. A 3/4-hp. motor operates the water-circulating pump, a 1/6-hp. motor operates a pump for circulating water through and out of the overflow system, and a 1/3-hp. motor is used to operate the blowers. The first two motors operate intermittently, while the blower unit for circulating the air operates continuously. Thus, the hourly consumption of electric current is but little more than that ordinarily required to operate fans in the dining room of a dining car.

The ice bunkers are charged with 300-lb. blocks of ice, which are placed on end in the bunkers. Water from the melting ice at around 40 deg. F. is pumped from the bottom of the ice chamber to a series of cooling coils and sprays, located in the conditioning unit. The cooling and air-washing water is then returned to the ice chamber, where it trickles over the top of the blocks of ice and runs down over the ice to the bottom of the chamber. Here it mixes with accumulated meltage



The ice bunkers—The circulating and overflow pumps and motors are located under the bunkers

water and is again pumped through the cooling and washing systems.

The rate of meltage of the ice is increased as the atmosphere becomes warmer. To take care of the excess water and at the same time to utilize the cooling effect before discarding it, a separate overflow system is provided. This overflow system, which is operated by the 1/6-hp. motor and pump, takes the excess water from the tank under the ice bunker, circulates it through a second series of cooling coils, and thence discharges it outside the car.

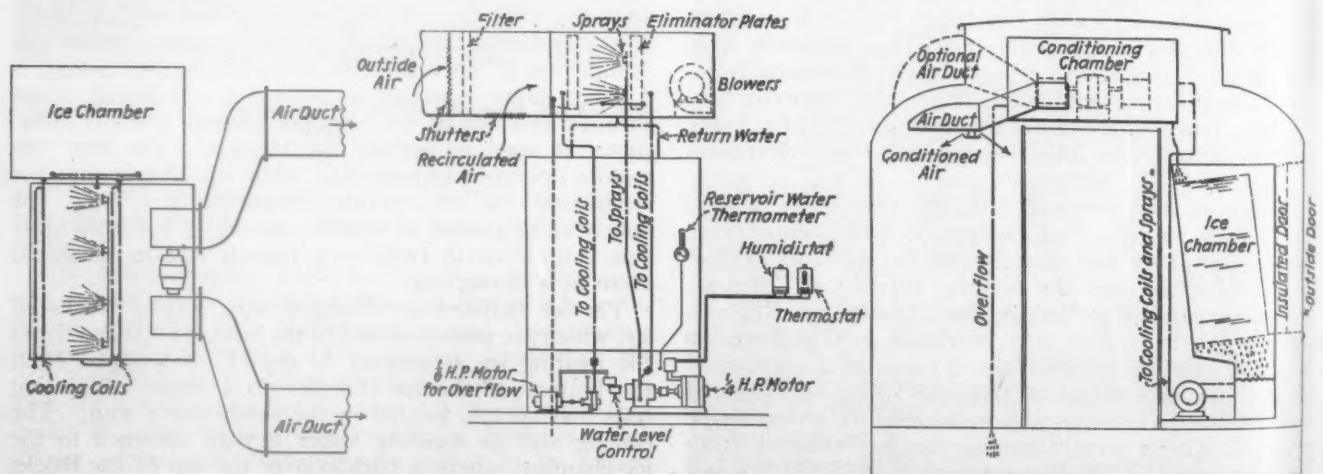


Diagram showing the operation of the Thermo-Gravity system

Outside air is taken into the car through a shuttered opening and filter. It then passes through the overflow cooling coils, spray, main circulating cooling coils and thence to two ducts which extend along the upper deck, one on each side of car. The air is then discharged through side openings in the ducts to circulate through the interior of car.

Air from the interior of the car is returned through a register which is located in the passageway ceiling near the conditioning unit. This air is mixed with outside air in case the shutters are open and is recirculated through the car. The system can be operated on recirculated air only by closing the shutters.

The operation of the 3/4-hp. motor, which drives the primary circulating and spray pump, is controlled by a thermostat and humidistat. A thermometer is also provided to indicate the temperature of the cooling water. Automatic operation of the overflow system is also provided by means of a float valve and water-level control at the tank under the ice bunker, which starts and stops the 1/6-hp. motor according to the amount of water in the tank.

The ice compartment occupies the space at the end of the car usually taken up by a saloon or locker, and its length is dependent upon the number of ice cakes required for the scheduled run. The cooling coils, sprays and blowers are assembled in a single conditioning unit which is located in the upper deck above the ceiling, at the same end of car as the ice compartment, which in the case of a dining car is the end opposite the kitchen. Access to this conditioning unit is provided by means of a hatch in the roof large enough to permit the installation or removal of this entire unit.

No underframe parts of the car are disturbed, and no additional electric generating apparatus is necessary in connection with the installation of this equipment. As shown in the illustration of the interior of car, the ducts are made part of the deck and ceiling construction and conform to the general interior scheme of decoration. The air outlets are concealed by a panel along the ceiling, the length of the passenger or dining compartment.

The automatic control for the operation of this air-conditioning unit is based on the comfort chart issued by the American Society of Heating and Ventilating Engineers. Each car is provided with a chart which shows the steward the proper setting of the thermostat based on the outside temperature prevailing. After reading the outside temperature the steward sets the thermostat in accordance with his chart and, after pushing a button which starts the system, provides an atmosphere conforming to temperature and humidity conditions set forth by comfort-zone limitations.

# Roller Bearings on Driving Journals Show Economies

By H. E. Brunner<sup>1</sup> and B. W. Taylor<sup>2</sup>

**A**NTI-FRICTION journal bearings have been successfully used by the railroads in the United States for more than 10 years and have become recognized as a useful part of the most modern equipment. The first applications were made on passenger-train cars. Some of these are now well past the million-mile mark and they have pointed the way to the development of this device for the more severe requirements of locomotive service. Long locomotive runs and high factors of availability have intensified the need for, and hastened the development of anything which would make the locomotive a better and more reliable machine.

The first anti-friction bearing equipped engine truck was placed in service some five years ago under a 4-6-2 type locomotive on the New York Central lines. It gave good results and, with some refinements of journal-box design, the same type bearings have been applied to a number of other engine trucks since that time. The developmental work has gone forward on this and other railroads as well, and some important achievements have been made.

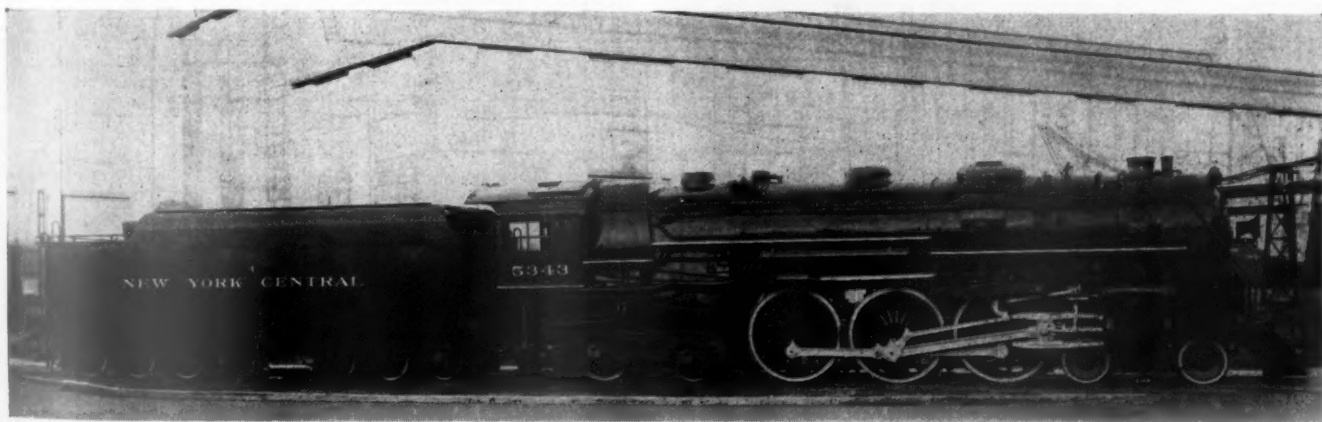
In October, 1931, the New York Central placed locomotive No. 5343, a 4-6-4 Hudson type, in passenger service. It was built by the American Locomotive Company with anti-friction bearings on the engine-

**New York Central 4-6-4 type locomotive No. 5343 makes over 130,000 miles in wide variety of passenger-train runs—SKF bearings applied on the driving, engine-truck and tender truck journals**

of 225 lb. The cylinders are 25 in. by 28 in., and the driving wheels are 79 in. in diameter. The total weight of the engine is 353,500 lb., of which 189,000 lb. is carried on the driving wheels. Other principal dimensions and weights are shown in the table.<sup>3</sup>

## Application of SKF Bearings to the Driving Journals

For simplicity of design, the same size journal bearing is used on all of the driving axles. It has the following dimensions: Bore, 11.4173 in.; outside diameter, 23.6220 in., and width, 7.0866 in. This gives a journal diameter of approximately 11 7/16 in. by 12 in. long. The axle loading is 63,000 lb. at the rail for all



New York Central 4-6-4 type locomotive equipped with SKF roller bearings—Built by the American Locomotive Company

truck journals, all the driving axles and tender-truck journals. This locomotive is used unrestrictedly in high-speed passenger service, handling limited trains between Harmon, N. Y., and Buffalo, N. Y., Harmon and Windsor, Ont., and Harmon and Collinwood, Ohio.

Locomotive No. 5343 exerts a main-engine tractive force of 42,300 lb. It is equipped with a Franklin booster which has a rated tractive force of 10,900 lb., making a combined tractive force for the locomotive at starting of 53,200 lb. The boiler operates at a pressure

axles. The bearing is the SKF spherical self-aligning type with two rows of rollers, a spherical outer race and with positive guiding of the rollers on the inner race. It provides complete flexibility for the axle with respect to the journal box and engine frame.

It is a self-contained, non-adjustable unit, carrying the static and dynamic loads, as well as the traction and braking reactions and the lateral thrust. This latter is taken by one row of rollers at a time, by virtue of their angular contact with the races, and is transferred directly to the pedestals by the thrust shoulder in the box and the journal-box flanges. All parts of the bearing, except the two retainers, are made of carbon-chromium steel hardened throughout, ground and polished. The

<sup>1</sup> Chief engineer, SKF Industries, Inc., New York.

<sup>2</sup> Railway engineer, SKF Industries, Inc., New York.

<sup>3</sup> A description of the New York Central 4-6-4 Hudson type locomotive was published in the March, 1927, issue of the *Railway Mechanical Engineer*, page 139.



### Main driving-wheel and bearing and box assembled on the axle

retainers serve to space the rollers properly and are made of alloy bronze. Their weight is carried on the raised central section of the inner race known as the "inner-race land."

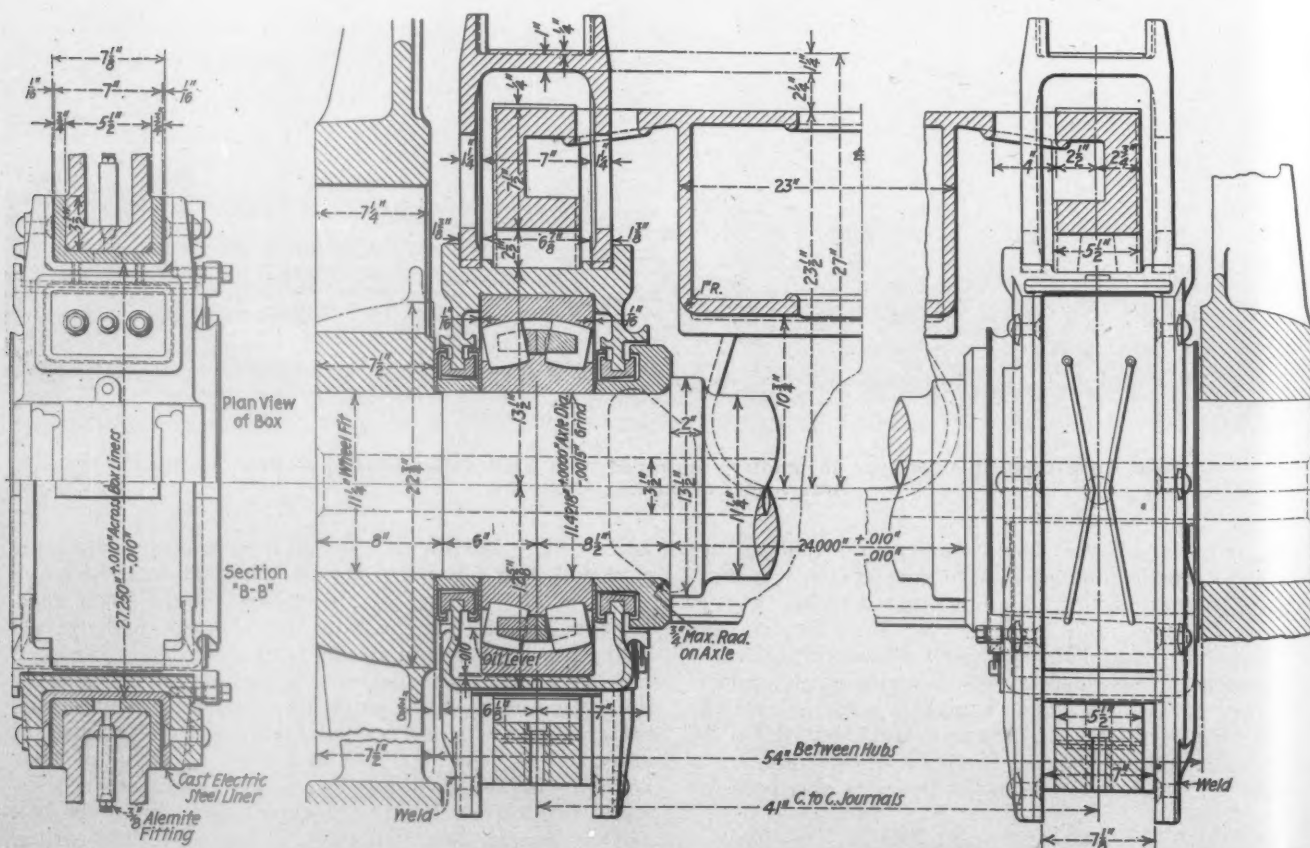
The journal itself has an accurately ground finish and the inner race is rigidly secured to it by a heavy shrink fit. The outer race fits a ground pad in the top of the journal box over 180 deg. of its circumference. Relief to the amount of .010 in. is provided in the lower half of the box. This construction has a number of advantages. It allows easy assembly and provides an accurate fit and positive support of the outer race over that part of its area which carries the combined load.

The journal box is of chrome-molybdenum electric-

furnace cast steel, heat treated, a material having an ultimate tensile strength of from 100,000 to 120,000 lb. per sq. in. and other physical properties which have made it satisfactory for this service. In form, the box is like the conventional driving box having a horseshoe shape for the upper half and an oil cellar for the lower half. The oil cellar is closely fitted to the top of the box and is secured in place by two wedges which are themselves locked by bolts and flat locking plates with bent-over lips. No bolts are used to hold the two parts of the box together. One of the illustrations shows the box, oil cellar and wedges for holding these parts together.

An interesting and important part of the mounting is the absence of the old type shoes and wedges which are used with friction bearings and which require so much attention from the shop and enginehouse forces. The box faces and flanges are fitted with cast-steel liners  $\frac{1}{2}$  in. thick. These are of chrome-molybdenum steel, made in the electric furnace and heat-treated. The material is similar to that of the box, except that it has better wear-resisting qualities. Both box and liner materials have excellent properties for resistance to shocks. The surface hardness of these liners as finish machined is approximately 250 to 300 Brinnell, and it has been found from experience in service that they tend to polish to a hard and smooth surface.

A shoe of alloy bronze  $\frac{3}{4}$  in. thick is used to line the pedestal and contact with the box liner. It is accurately fitted to the pedestal with only enough clearance to facilitate mounting (about .003 in.), but is not held with bolts or rivets. The channel ways of the box are milled to take the box liners and these latter are machined all over for a tight fit in the box and a smooth finish on the wearing surfaces. There are four rivets with counter-sunk heads in each box flange to hold the liners, and they are driven after the liner is fitted to the



**Cross-section along the axle of the bearing mounting as applied to the driving journals**

box. The finish machining of the wearing surfaces is done after the liners are on the box, thus assuring an accurate dimension from the vertical center line of the box to each face, and also between the box flanges.

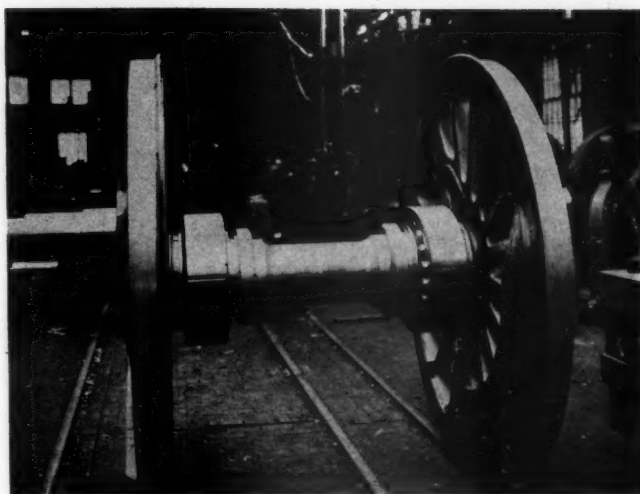
The box flanges are extended at the bottom to contact with the shoes for the full length of the pedestal. They are made of greater area than is customary with friction boxes. This is to stabilize the box and prevent tilting and rapid wear of the shoes and liners. They are assisted by the application of the load through a spring saddle on top of the box and by the driving-box pressure against the frame, and accomplish the desired result effectively.

### Bearing Lubrication

The Alemite lubrication system is used for lubricating the wearing surfaces. Two pockets are located at the top of the box for holding the grease, which is the usual cup grease used on the motion work.

One of the major advantages of using anti-friction bearings on driving boxes is the elimination of box pound and the maintenance expense which it produces. In the design for this locomotive, the problem was to get shoes and box liners which would show minimum wear, this wear to be slight enough so that the engine could run from shopping to shopping without requiring any driving box attention whatever.

Some interesting results have been obtained on locomotive No. 5343 in this respect. The locomotive was delivered to the railroad and placed in service October 27, 1931. Its mileage to May 31, 1932, was 98,879 miles, of which 16,864 miles was the mileage for the month of May. The following are measurements of

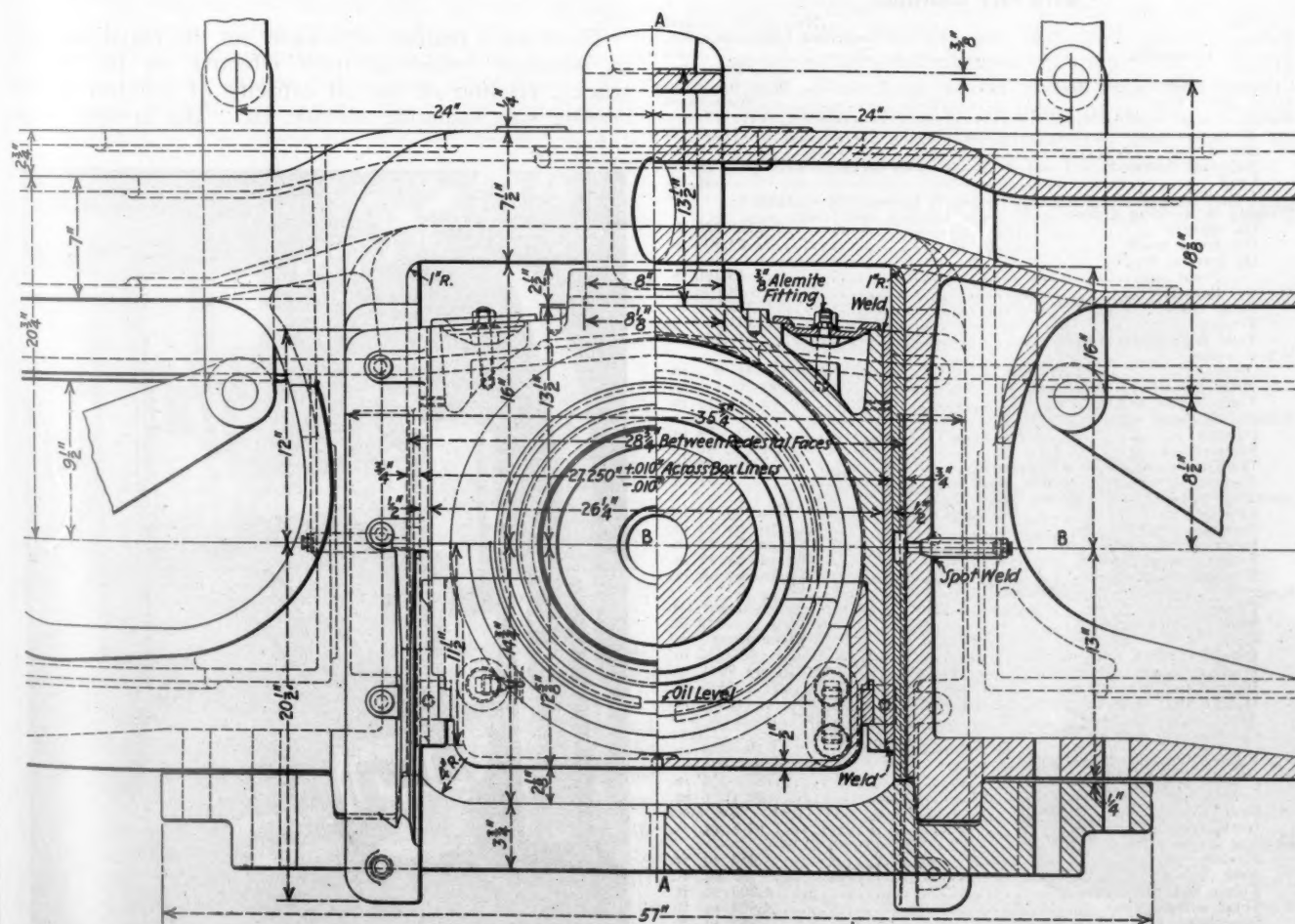


Driving wheel and axle assembly with the boxes removed

the total clearance for the main driving boxes in the pedestals:

	Right main, in.	Left main, in.
At A. L. Co. plant, October 27, 1931.....	.017	.019
At R. R. shops, Harmon, N. Y., January 26, 1932, 30,000 miles.....	.017	.018
At R. R. shops, E. Syracuse, N. Y., May 2, 1932, 80,000 miles.....	.027	.028

Much care was given to the method of sealing the box to retain the oil and exclude water and foreign matter, because of the importance and the difficulty of keeping out the water used in engine house wash-downs or on the washing rack. From time to time samples of



Cross section showing the bearing and box application to the driving journals of locomotive No. 5343



Tender truck equipped with SKF bearings

the oil have been taken and have shown freedom from water or foreign matter.

The lubricant used is valve oil as supplied to the railroad's shops and enginehouses. The level carried is just sufficient to cover the center of the lowest roller in the bearing. A gage has been provided for the use of the enginehouse men in checking the oil level. The gage has a maximum and a minimum level, with  $4\frac{1}{2}$  pt.

Table of Dimensions, Weights and Proportions of the New York Central Locomotive No. 5343 Equipped With SKF Bearings

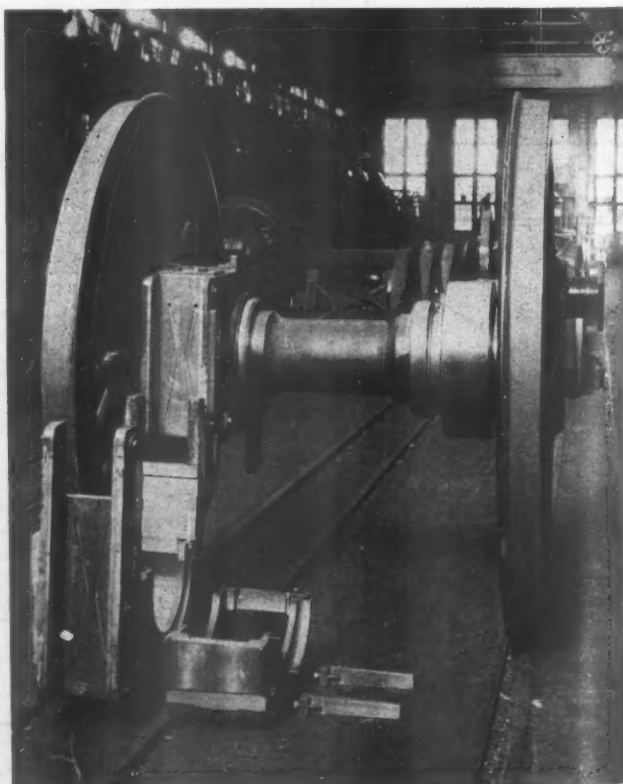
Railroad	.....	New York Central
Builder	.....	American Locomotive Co.
Type of locomotive	.....	4-6-4
Service	.....	Passenger
Cylinders, diameter and stroke	.....	25 in. by 28 in.
Valve gear, type	.....	Walschaert
Valves, piston type, size	.....	14 in.
Maximum travel	.....	9 in.
Steam lap	.....	1-7/16 in.
Exhaust clearance	.....	3/4 in.
Lead	.....	3/4 in.
Cut-off in full gear, per cent	.....	86
Weights in working order:		
On drivers	.....	189,000 lb.
On front truck	.....	64,500 lb.
On trailing truck:		
Front	.....	45,300 lb.
Rear	.....	54,700 lb.
Total engine	.....	353,500 lb.
Tender	.....	303,000 lb.
Total engine and tender	.....	656,500 lb.
Wheel bases:		
Driving	.....	14 ft. 0 in.
Total engine	.....	40 ft. 4 in.
Total engine and tender	.....	83 ft. 7 1/2 in.
Wheels, diameter outside tires:		
Driving	.....	79 in.
Front truck	.....	36 in.
Trailing truck, front wheels	.....	36 in.
Trailing truck, rear wheels	.....	51 in.
Journals, diameter and length:		
Driving, main	.....	11 1/2 in. by 14 in.
Driving, others	.....	11 in. by 13 in.
Front truck	.....	7 in. by 12 in.
Trailing truck, front	.....	6 1/2 in. by 12 in.
Trailing truck, back	.....	9 in. by 14 in.
Boiler:		
Type	.....	Straight top
Steam pressure	.....	225 lb.
Fuel	.....	Bituminous coal
Diameter, first ring, inside	.....	82-7/16 in.
Firebox, length and width	.....	130 in. by 90 1/4 in.
Height mud ring to crown sheet, back	.....	65 1/2 in.
Height mud ring to crown sheet, back	.....	86 3/4 in.
Arch tubes, number	.....	4
Combustion chamber, length	.....	None
Tubes, number and diameter	.....	19-3 1/2 in.
Flues, number and diameter	.....	37-2 1/2 in.
Length over tube sheets	.....	182-3 1/2 in.
Grate type	.....	20 ft. 6 in.
Grate area	.....	Cast steel
Heating surfaces:		
Firebox	.....	81.5 sq. ft.
Arch tubes	.....	253 sq. ft.
Tubes and flues	.....	35 sq. ft.
Total evaporative	.....	4,203 sq. ft.
Superheating	.....	4,491 sq. ft.
Comb. evaporative and superheating	.....	1,965 sq. ft.
Tender:		
Style	.....	Water bottom
Water capacity	.....	14,000 gal.

Fuel capacity	.....	28 ton
Journals, diameter and length	.....	6 in. by 11 in.
General data estimated:		
Rated tractive force, 85 per cent, engine	.....	42,300 lb.
Rated tractive force, booster	.....	10,900 lb.
Combined tractive force	.....	53,200 lb.
Weight proportions:		
Weight on drivers—total weight, engine, per cent	.....	53.5
Weight on drivers—tractive force	.....	4.48
Total weight engine—comb. heat. surface	.....	54.7
Boiler proportions:		
Tractive force, engine—comb. heat. surface	.....	6.54
Tractive force, engine x dia. drivers—comb. heat. surface	.....	517
Firebox heat. surface—grate area	.....	3.5
Firebox heat. surface, per cent of evap. heat. surface	.....	6.4
Superheat. surface, per cent of evap. heat. surface	.....	43.8

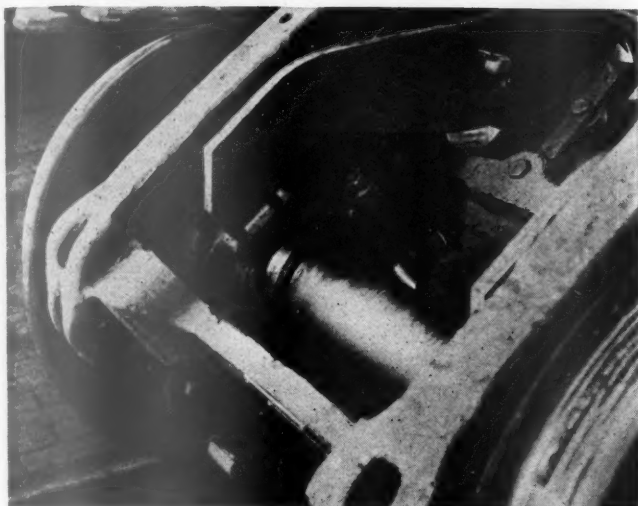
allowable variation, and it is necessary to add oil only when at the minimum. A check of the oil level once a month is sufficient, but the enginehouse men, from habit in handling other equipment, usually do it more often than this. No record is at present available of the amount of oil which has been added since the locomotive went into service, but the quantity has been very small. The oil capacity of the box is  $20\frac{1}{2}$  pt. and little additional is required between shopping periods of more than 100,000 miles. This is also true for the engine- and tender-truck boxes, for which the oil capacities are 8 and  $5\frac{1}{2}$  pt., respectively.

Much interest was manifested in the operating temperature of the bearings on the main journals. To determine this immediately at the end of a run and before cooling had taken place, a thermometer well was fitted to one box on the main driver. This enabled temperatures of the oil to be taken quickly and the operating temperature definitely determined as atmospheric plus 20 deg. to 30 deg. F. For the engine-truck bearings, this is atmospheric plus 15 deg. to 25 deg. F., and for the tender-truck bearings, atmospheric plus 35 deg. to 55 deg. F.

There are a number of reasons for the variation, such as windage (which is most effective on the engine truck), relation of the oil capacity of the box to the bearing size, radiating surface, etc. The greater range



Wheel and axle assembly with one box removed to show the construction



Engine-truck journal assembly—The truck is tilted to show the box application

of temperatures on the tender-truck boxes is attributable, in a large measure, to the varying load which is 24,750 lb. with fully loaded tank, and 12,000 lb. with coal and water at the minimum.

The lateral float of the axles is another of the important details of the design. With a three-axle driving-wheel base of 14 ft., the lateral is 9/32 in. total for the axle with respect to the frame and is the same for all three driving wheels. This is a fixed quantity and does not change except by the amount of wear between the driving-box flanges and pedestals which is relatively small. It has previously been pointed out that the spherical bearing takes the thrust load on the axle directly, as well as the radial load which comes from the dead weight and from the piston thrust. The elimination of hub liners and the maintaining of practically a constant axial float are decided advantages which are obtainable from this construction. The same

#### Typical Runs Made with Locomotive No. 5343 During December, 1931, and February, 1932

Train No.	Description	Date of arrival at Harmon enginehouse
22	Lake Shore Limited.....	December 1
X4	Fast mail, 20-hr. train New York-Chicago.....	December 5
22	Lake Shore Limited.....	December 6
168	Local .....	December 9
56	DeWitt Clinton (Express).....	December 11
70	Local .....	December 13
8	The Wolverine .....	December 15
68	The Commodore Vanderbilt.....	December 18
18	Hudson River express.....	December 21
18	Hudson River express.....	February 12
X4	Fast mail, 20-hr. train New York-Chicago.....	February 14
22	Lake Shore Limited.....	February 15
X4	Fast mail, 20-hr. train New York-Chicago.....	February 19
40	Exposition Flyer.....	February 20
X4	Fast mail, 20-hr. train New York-Chicago.....	February 22
40	Exposition Flyer.....	February 24
40	Exposition Flyer.....	February 26
68	The Commodore Vanderbilt.....	February 28

thing is true regarding the engine-truck boxes and bearings, this being one of the important reasons for their use.

The locomotive has a Commonwealth cast-steel bed. Forty-eight-inch driving springs rest on spring saddles which span the side frame and are located in machined seats on the tops of the boxes. The greater space required by the anti-friction bearing box is at once apparent. For example, on the main driver the pedestal opening for the friction box is 16½ in. and the anti-friction box, 27¼ in., but the latter does not require the use of a wedge. The distance from the center line of the journal to the spring-saddle seat on top of the box is 10 in. for the friction box and 13½ in. for the

anti-friction box. The clearance between the top of the box and the under side of the frame is 2½ in. The pedestal cap is secured with four bolts and is of the customary type, except that it is recessed slightly on top to provide clearance for the bottom of the oil cellar.

The question of weight is always of interest in the design of modern power. The following comparative figures are given for locomotive No. 5343 and for a plain-bearing engine of the same class built at the same time. They show the weights at the rail of the driving-axle assemblies up to, but not including, the driving springs, but including the revolving weights:

	Front driver, lb.	Main driver, lb.	Rear driver, lb.
(1) .....	15,400	20,500	15,400
(2) .....	13,000	18,400	13,000

(1) Locomotive No. 5343.

(2) Plain-bearing locomotive of the same class, J-1-e.

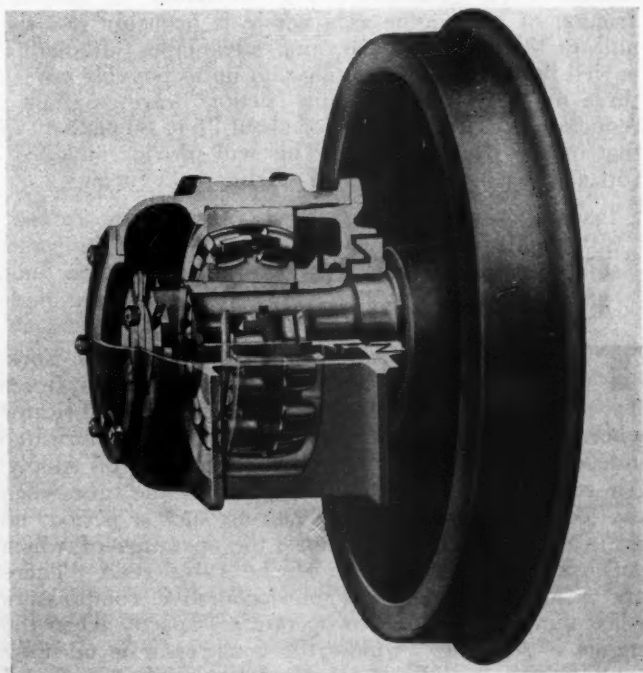
This may appear to be a serious disadvantage in weight for the anti-friction bearing, but even with this engine, where the axle loading was limited to 63,000 lb. at the rail, it was not difficult to provide, in the design of the engine as a whole, for the increased weight of the anti-friction bearing parts.

The weights of the individual items (journal bearing, box and parts complete, pounds per journal) for the three different journal locations are as follows: For the driving axles, 1,794 lb.; for the engine truck, 475 lb., and for the tender trucks, 545 lb.

#### Engine-and Tender-Truck Journal Bearings

The bearing arrangement for the engine truck<sup>4</sup> is one which has been used for several years on this and a number of other railroads. It has one self-aligning spherical roller bearing per box and possesses many of the advantages which have been cited for the driving box, such as constant lateral of the axle, elimination of the hub liner, simplicity of lubrication, etc. The box itself is made of electric-furnace cast steel and is split on the horizontal center line to facilitate inspection of

<sup>4</sup> See *Railway Mechanical Engineer*, April, 1923, Page 225, and August, 1930, page 480. Also *Railway Age*, Daily Edition, June 20, 1928, page 1420 D52.



Phantom view of the SKF journal box and bearing as applied to outside journals

the bearing. Manganese-steel wear plates are provided for the equalizer seats and the same material is used for the box flange liners. The outer race of the bearing fits in a ground pad extending over 150 deg. in the top of the box. This is true also for the tender-truck box. An interesting and advantageous feature outside the bearing mounting itself is the use of a standard tender-truck wheel instead of the usual engine-truck wheel, this being possible since no hub liner is required.

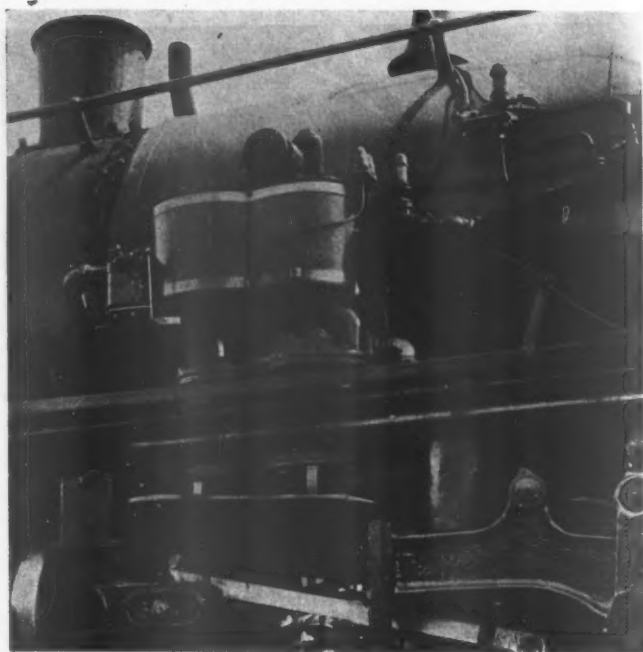
In general principles, the tender-truck journal-bearing mounting follows the standard construction used by the manufacturer for outside journals for cars. A tapered-bore bearing and tapered sleeve, driven up tight by the heavy nut on the end of the axle, are used to secure the inner race of the bearing to the journal. This permits of easy and quick assembly and removal. The cast-steel boxes are designed with provision for the application of a train-control device to one box per tender, and this gives them the appearance of being flattened on either side as shown in the illustration of the tender truck. The same pattern with removable parts was used for boxes with or without a train-control receiver. The internal construction is illustrated by the phantom view of the journal box and bearing as applied to outside car journals, except that this does not have the enclosure designed to exclude water from the track scoops. Water which otherwise would enter the box is thrown off by a guard or "flinger" on the axle and runs out through a slot in the bottom of the cavity in which the flinger turns. The necessity for some such an arrangement was anticipated from the trouble which has sometimes been experienced from the entrance of the track-scoop water into plain-bearing boxes. The present device has served satisfactorily in this regard.

Locomotive No. 5343 has not as yet been scheduled for its first general overhauling. There are many points about its performance which have been and will continue to be closely watched, but on which no data are available at this time.

The anti-friction bearings, in maintaining a constant lateral for the driving axles and reducing driving-box pound to a small quantity, should make possible an improvement in the performance of the rod bearings and motion work generally. The reduction in machine friction of the engine as a whole is probably less significant than some of the other advantages, although it is well known that at starting and up to possibly two or three miles an hour the anti-friction bearings show a reduction in friction torque of about 75 to 80 per cent of that of the plain bearing. This will provide added effort at the tender drawbar in starting heavy trains.

## Force-Feed Lubricators For Air Compressors

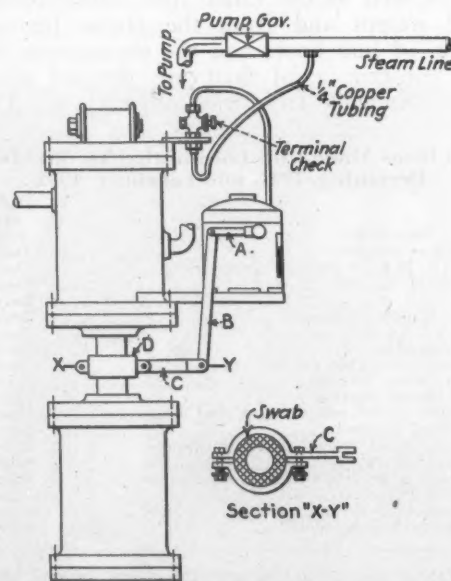
**T**HE Q & C Company, 90 West street, New York, has developed a further application of its Bosch Type AROB mechanical force-feed oil lubricator whereby locomotive air compressors can be lubricated independently of any other power source or oil supply. Air compressors operate a large part of the time when the locomotive is standing. During such a period, no oil is received from lubricators, the operation of which depends on the movement of the valve gear. There are also special demands on locomotive compressors when they are required to operate at capacity when the engine is standing. Unless the compressor is oiled by hand, which is difficult to do satisfactorily, continued operation over an extended period of time will have



Bosch Type AROB lubricator applied to an air compressor

serious results because of the lack of adequate lubrication.

The Type AROB lubricator has an oil capacity of 3.25 pt. and weighs 22 lb. empty. It is designed for continuous service against resistance pressures up to 375 lb. per sq. in. Any number of feed outlets up to 10 can be obtained. In the application shown in the two illustrations only one feed into the air-compressor steam line is provided. However, a second feed line



Sketch showing the application of the mechanical lubricator to an air compressor

to lubricate the piston rod and feeds to other points can be installed if desired without splitting the lines.

The drive mechanism and pump units are essentially the same as in other Bosch types. The pump shaft can operate at a maximum speed of 10 r. p. m. The rate of oil feed recommended for the steam line is from 3 to 4 drops per 100 strokes of the compressor. The lubricator, at maximum speed, can feed 4.08 fluid ounces of oil per hour from each outlet.

The lubricator drive is connected, as shown in the drawing, to the piston rod of the compressor. The connection at the piston rod consists of a swab *D* to which is clamped the arm *C*. The clamps around the swab *D* are secured by two bolts which are provided with coil springs so that wear on the swab is taken up automatically. A feed line from the lubricator to the swab can be applied, as already mentioned, to lubricate the piston rod.

The ability of the swab to move with the piston rod depends largely on the binding action of the swab around the rod. The arm *C* is connected to one side only, which causes the swab and holding clamps to twist vertically as the rod moves.

The arm *C* actuates the connecting link *B* which in turn operates the oscillating arm *A*. A slight vertical movement of the swab *D* is sufficient to operate the lubricator pumps.

## Foam-Meter For Locomotives

**A**N electric foam-meter which indicates the foam conditions in a boiler and which automatically opens and closes a blow-off valve when that is necessary, is now being marketed by the Electro-Chemical Engineering Corporation, a subsidiary of the Pyle-National Company, Chicago, Ill. The condition of foam in the boiler is detected by two pairs of electrodes set into the top of the boiler above the forward end of the firebox. One pair of electrodes is longer than the other. In each case, one electrode of each pair is insulated with Bakelite and the other is in contact with the boiler shell. The balance of the equipment consists of a signal foam-meter with yellow and red light indications placed on the boiler head, an automatic 3/4-in. air-operated blow-off valve and several relays.

When the foam rises high enough to reach the long pair of electrodes they are short circuited by the foam.



Signal Foam-Meter applied to the boiler-head of a locomotive

This completes a circuit which includes a sensitive relay that receives its current from the headlight generator or a battery. The relay in turn causes the 3/4-in. blow-off valve to open and lights the lower or yellow signal in the foam-meter. After the boiler has been blown down sufficiently, the foam subsides below the end of the electrode, thus breaking the electrical circuit through the relay and simultaneously the secondary circuit operating the Electromatic blow-off valve, thus closing the valve.

The valve operates only after the foam has contacted the long pair of electrodes for at least 15 seconds. This is accomplished by a thermostatic time delay placed in series with the electric circuit operating the Electromatic blow-off. This time delay prevents undesirable frequent operation of the blow-off valve due to momentary contact of foam or water with the electrodes. Such momentary contact may be caused by surging or splashing of the water in the boiler.

Should the foam rise high enough to reach the short pair of electrodes, the red light in the foam-meter indicates an unsafe foaming condition, which calls for the manual operation of a main blow-off cock to supplement the Electromatic blow-off.

## One Hundred Years Ago This Month

*Brief synopses of or quotations from articles and news items selected from the American Railroad Journal*

**November 3, 1832.**—This issue of the *Journal* contains an article by J. L. Sullivan, formerly of the U. S. Board of Engineers, in which he discusses the economic advantages of two railroad routes and the means of economy, and reasons for national aid exemplified in the case of South Carolina. Mr. Sullivan advocated two railroads laid with wooden rails, one to extend to the Great Lakes along the route now followed by the Delaware, Lackawanna & Western, and a second line from New York across Pennsylvania to the Allegheny River.

**November 10, 1832.**—An illustration of an English steam highway coach built by Messrs. Ogle and Summers is shown in this issue. The editor states: "We believe that the patent boiler is the main cause of their success, as containing the greatest possible heating surface within the smallest possible space, and without any danger, although worked at 200 lb. on the square inch, and capable of bearing 294 lb.; in fact, this boiler presents 398 ft. of heating surface, and at the pressure of 200 lb. to the inch, exhibits upwards of nineteen millions of pounds of pressure, without the slightest danger! The cylinders are 12 1/4 in. in diameter with metallic pistons, and the whole of the machinery is carried horizontally under the body of the carriage."

**November 17, 1832.**—The first beautiful cars of the Harlaem Railroad appeared on the streets of New York City. They were built by Mr. Miln Parker of New York. They are spacious and convenient, being divided into three distinct apartments, each amply large enough for eight, and can accommodate very conveniently ten persons, or 24 to 30 passengers inside.

**November 24, 1832.**—Richard Berrian has been awarded a patent by the Honorable Secretary of State for a locomotive which runs on three rack rails. All four driving wheels are provided with large gears which are directly connected to vertical pistons on top of the boiler. A third gear wheel, which meshes with the teeth of the center rack, is keyed to the front axle, at the center.

# EDITORIALS

## Share-the-Work Plan

One of the most peculiar expressions—considering its source—which has come to our attention in a long time is the advance copy of an editorial to be published in the Railroad Trainman, official journal of the Brotherhood of Railroad Trainmen, entitled, "A Communistic Form of Wage Cutting." It drastically attacks the Teagle or "Share-the-Work" campaign which grew out of President Hoover's economic conference on employment.

We take our hats off in admiration to those labor representatives who in these trying times have worked to the very limit of endurance in assisting the members of their organizations who have suffered from lack of employment and diminished earnings. This depression, however, has not alone affected the railroads, but is nation-wide and world-wide. Very few groups have escaped heavy cuts in income or entire loss of income. The fine thing about it has been the spirit of sharing with others in distress, which is so much in evidence. Millions upon millions of dollars have been raised for welfare work. As far as possible, an attempt has been made to distribute this money so that it has not been doled out on a charity basis, but has involved some service. The "share-the-work" programs spread the available work over larger groups and give a greater number of employees some earned income, thus preserving their self-respect and morale.

We are in an emergency and this is no time to split hairs over technicalities. We have had a lot of talk about the Golden Rule. Here is a real opportunity to practise it. President Whitney of the trainmen's organization sees in the movement a veiled effort on the part of the employers permanently to cut down the wages of the workers and lower their standards of living, and so objects strenuously to its adoption. We cannot believe that there is serious danger of his fears coming to pass. Railroad managements have too high a respect for the splendid way in which the employees and their leaders in large part have worked shoulder to shoulder with them in the trying years through which we are now passing.

Mr. Whitney also advances the following argument: "Although wage cuts have greatly reduced the ability of the masses to purchase anything but essentials, there are still those who are able to purchase something besides the bare necessities of life. The share-the-work plan would reduce their incomes below the point which would permit them to buy more than the bare necessities of life and would virtually kill the markets for commodities other than those actually required for human existence. \* \* \* \* Charity is sustaining the markets for life's necessities; we must bring back the markets for other commodities before general prosperity will be possible." In other words, let the poor devils who are out of work stay out, and take a chance on living on charity.

The reserves of most employers have been seriously depleted or entirely wiped out. Many business concerns are fighting for their very lives. Payrolls cannot be met if credit is exhausted and money is not available. We must, in the emergency this winter, divide what is avail-

able. Either some can take it all, as Mr. Whitney apparently advocates, or the "share-the-work" program can give some work to the largest possible number of people.

## Two Reasons For Capital Expenditures

The depression has greatly stimulated attempts to analyze the industrial and commercial processes which constitute our present economic system. It has brought to light many theories by which to account for the dire situation into which we have fallen and schemes for artificially controlling production and distribution for the purpose of insuring a greater degree of economic security in the future. Some of these schemes are based on emotional reactions. They deal in generalities, the truth and force of which must be tested by a quantitative study of the streams of materials, energy, goods and purchasing power, the flow of which constitute the processes of industry and commerce. The facts for such a study are only partially available, at least to the average business executive.

One of the theories which has received considerable attention, and in support of which several books have been written, runs to the general effect that we are at or near the end of the era of expansion of our industrial system, that the industries supported by the capital expenditures of our industrial establishment as a whole have done their big job, and that in the future they must be content with making the replacements in this more or less completed establishment. Corollary to this is the proposition that invention has ceased to create new wants sufficient to absorb the surplus man power created by the increases in general industrial efficiency, and that, indeed, invention has been devoted more largely to effecting these increases in efficiency than to creating new wants.

Whether or not and to what extent this idea may be proved sound as the basis for future industrial policies, one fact stands out sharply in the present situation; that is, that replacements are and will continue to be a factor in the continued operation of our industries. It is also clear that whatever one's belief as to the future course of social and industrial development in this country may be, no industry can now afford to neglect the opportunities for improving its own efficiency and reducing its costs made available by improvements in the type of machinery it buys with its capital expenditures. As long as men are willing to pit themselves against the forces of nature and to pit their own skill and ability against that of their fellows, the industry which persistently fails to take advantage of these opportunities will inevitably wither and die.

The National Committee on Industrial Rehabilitation, of which A. W. Robertson, chairman of the Westinghouse Electric & Manufacturing Company, is the chairman, was organized late in August under the banking and industrial committees of the twelve Federal Reserve districts. Subcommittees are being formed in each district. The purpose of this organization is not the creation of another "Buy Now" campaign. Its aim is to secure the attention of all the officers of industrial organizations to this basic need for keeping their plants up to date and to see that none with the resources to

make the needed improvements shall withhold his decision to do so under the paralyzing effect of fear of the future.

The unprecedented losses in traffic and revenue which the railways have suffered have destroyed the credit of some companies and have seriously affected that of all of them. As a whole, the railway industry is not one likely to be moved by appeals for making capital expenditures having a view to their future effects. Ample testimony is available, however, as to the efficacy of capital expenditures for improved motive power as a means of improving the immediate situation during the depression. A few roads have found it expedient to add to their supply of modern motive power during the depression. One of these, the Lehigh Valley, has earned a return of 38 per cent on its investment in 20 modern locomotives under the existing light traffic conditions. Modern locomotives are being subjected to intensive utilization throughout the depression on all roads which possess them, and they have been a large factor in the ability of some roads to weather the storm.

Considering the widespread distribution of increased purchasing power which an increase in the volume of production in the equipment industries will effect and the possibilities for an immediate return on well chosen investments of this character, mechanical officers should leave no stone unturned in their field to bring to light every opportunity of this kind, whether it be motive power, rolling stock, or a bad shop or engine-terminal situation. No large-scale increase in production and distribution is likely to take place until orders are released for the things which are purchased by capital expenditures. Present unemployment in the industries producing them is said to exceed a million and a half. Each of these men who is re-employed will provide employment for three others in the production of materials. The buying power thus provided will have a far-reaching effect in stimulating employment in the industries producing the necessities and luxuries which people purchase for their own use.

Only as such increases in industrial activity take place can the railways expect an improvement in traffic and earnings. Any railroad which withholds capital expenditures for which there is economic justification, and for the making of which resources can be found, is standing in the way of improvement in the volume of railway traffic and earnings.

### Fighting for a Square Deal!

Few people have escaped the effects of the economic depression, but the railroad group has been particularly hard hit. The falling off of general business, with its effect on railroad traffic, was bad enough, but in the case of the railroads it has been intensified by unfair competition on the part of over-the-road highway carriers. Serious financial disaster has been averted only by the practice of the most drastic economies and by aid from the Reconstruction Finance Corporation.

Except in a very few states the highway common carriers are subjected to but few regulations. They use a right-of-way furnished and maintained by the public; their tax payments and license fees do not begin to cover their fair proportion of highway costs. Part of the cost of over-the-road highway transportation is thus borne by the tax-paying public. The railways on the other hand are closely regulated in almost every direction. Their rates are fixed; they must pay heavy taxes which go into the public treasury, some of this money being

used to help maintain the highways over which their competitors operate. Under such conditions it is difficult to see how the railways can continue to prosper or even to exist. These facts have been clearly evident, but protests on the part of railroad managements have been of little avail in securing relief.

Railway employees have been very hard hit, as indicated by the accompanying tables. One of these shows how greatly the total number of railway employees has decreased in the past five years and also how seriously their average compensation has been affected. The other shows what has happened to the employees in the maintenance-of-equipment and stores departments. The fig-

Wage Statistics for the Month of July—All Employees—  
Class I Steam Railways, Including 16 Switching  
and Terminal Companies

	Average number of employees	Total compensation	Average compensation
July, 1928 .....	1,728,690	241,831,372	139.89
July, 1929 .....	1,744,896	254,894,891	146.08
July, 1930 .....	1,531,711	217,885,133	142.24
July, 1931 .....	1,309,793	183,864,067	140.37
July, 1932 .....	1,021,937	120,559,627	117.98

ures for the month of July have been compared for the five years, since the latest available data when this comment was prepared were for the month of July, 1932. The facts speak for themselves and require no comment.

The railway employees have naturally become seriously disturbed by these conditions. They have watched the over-the-road highway carriers take business away from the railroads and in studying the situation have become impressed with the fact that the competition on the part of such carriers is exceedingly unfair. Railroad employees work for standard wages, established

Wage Statistics for the Month of July—Maintenance-of-  
Equipment and Stores Departments—Class I Steam  
Railways, Including 16 Switching and  
Terminal Companies

	Number of employees at middle of month	Total compensation	Average compensation
July, 1928 .....	457,943	60,107,435	131.25
July, 1929 .....	454,638	64,524,871	141.92
July, 1930 .....	397,588	52,067,759	130.95
July, 1931 .....	342,915	42,733,661	124.61
July, 1932 .....	266,898	26,137,432	97.93

under processes controlled by a federal railroad labor act. Their working conditions have steadily improved over the years until they are now on a relatively high basis. As they have compared their compensation and working conditions with those of the truck and bus drivers, they have recognized one of the reasons why highway transportation costs are as low as they are.

They have not stopped here, but have gone on to study thoroughly the question of highway competition. When they awakened to the real facts they started, without any coaching on the part of the railroad management, and in most cases without the knowledge of railroad management, to form railway employees' and taxpayers' associations. It did not require much effort to get the merchants and professional men with whom they deal to join these associations. In some instances the state highway authorities have been keen to co-operate with them, and this is also true of the local city truckers, who suffer unfairly from the competition of the over-the-road highway operators.

The legislators—when they have realized the number of votes involved—have not been slow to recognize the extent and justice of this movement and in Virginia and Kentucky laws have been enacted which at least attempt to bring more nearly in line the regulation of the over-the-road highway carriers and the railroads. What has been done in these two states will undoubtedly be repeated in many other states in the coming months. The

fight will only be well started, however, since after these laws are passed special efforts will have to be made to see that they are enforced.

Employees of the mechanical departments of the railroads have had and are taking a large part in this activity. Eventually it may mean that all of the common carriers will be regulated alike and under the same agencies. Regardless of whether or not it reaches this ideal, the movement is one greatly to be commended, since it is in the interests of public welfare and will tend also to stabilize railroad and transportation conditions and employment.

## The Trend Of the Times

The extraordinary economic conditions which the railway industry and the business of the world has had to face for the past two years has led all men in positions of responsibility to examine past and present practices from a new point of view. We are less sure that the methods and practices slowly developed over many years can be depended upon as a sure guide for our future action than we were three years ago. Many of us have found it necessary to take actions of which we had scarcely dreamed before. Few railroad officers now believe that the familiar conditions in their industry will return with a resumption of a more nearly normal business activity in the country, or that the trends with which we have long been familiar will again resume their course.

In addressing one of the annual meetings of the American Railway Association, Mechanical Division, President R. H. Aishton gave good advice when he said: "My only advice to you is, and I don't say it in the way of criticism at all, but I say it as a matter of advice, that these are the days when we must protect the practices and the rules and all that kind of thing which we have developed in the last 50 years, but we must take this new condition as it is and we must so adjust ourselves that we can look on whatever has been good in the past but which, under present conditions, in the future should go into the discard, and we should be fearless in discarding those things."

Out of the difficulties which the railroads have been facing for the past few years a new trend is beginning to develop. The competition of motor trucks on improved highways in many parts of the country has forced the railroads to seek new methods in the service of the public. There is, for instance, the container, the use of which has been growing in recent months. There is the transportation of truck bodies and contents at what amounts to a mileage rate; there is the compartment car for team track service of l.c.l. shippers under a separate tariff; there is the development of a store-door collection and delivery; there is the inauguration of high-speed merchandise freight service. There are the special types of cars for bulk loading of certain commodities, such as cement, lime, etc., some of which formerly required packaging for shipment in box cars. These developments suggest a trend in railroading in which the field of conventional methods and equipment are going to be encroached upon by special methods and equipment, tailor-made, so to speak, to meet special conditions. In meeting these conditions there is little in the past by which to be guided and each railroad must solve its own problems in its own way, exercising the utmost ingenuity of which its officers are capable.

In most of these situations the time element is of the utmost importance. This means that the elimination of delays in the terminal and on the road will become increasingly necessary, and it means in many cases high running speeds. As speeds increase, the riding qualities of freight equipment will become of ever increasing importance.

Locomotive design and construction have undergone many changes in the past few years. There has been a general stepping up of horsepower capacity and an improvement in reliability of details. Modern freight locomotives are capable of meeting increasing demands for more speed, with economy both as to train loading, fuel and maintenance. For some years, however, the ever increasing amount of traffic which we have long been accustomed to expect has not been in evidence. Furthermore, motive power has been used much more intensively and thus, in the face of the great improvements in the effectiveness of motive power which modern design has placed at the disposal of the railroads many roads are finding themselves without the need for additional locomotives to increase the amount of available tractive force at their disposal and with no immediate prospect of any marked change in that situation.

How, then, will the railroads be able to avail themselves of the more efficient tools needed to meet the present trend in operating conditions and the growing demand for reductions in operating expense which will not cease even after business conditions have resumed something like their normal course? This is a matter with which executive officers will have to deal, but it is of no less concern to motive power department officers. Who is better equipped to formulate and fight for a definite policy for the retirement of old and acquisition of new motive power which will get in hand the accumulation of obsolescence that is now running wild?

Many of the new problems of railroading are not departmental problems at all. They are transportation problems in the broadest sense of that term. Their solution is going to demand that traffic, operating, and mechanical department officers work closely together, each with an understanding of the common objective and ability to grasp the viewpoint of the others. The common objective is to see that steam railroads maintain the position, which they have so long held unchallenged, as the best and cheapest transportation machine in the world.

## NEW BOOKS

Standards Yearbook, 1932. Published at the United States Government Printing Office, Washington, D. C. Miscellaneous Publication 133. 400 pages. Bound in buckram. Price, \$1.

The Standards Yearbook, prepared annually by the Bureau of Standards, U. S. Department of Commerce, includes summaries of important national and international standardization activities and accomplishments of the Government standardizing laboratories of England, France, Germany, Canada, Japan, and the Bureau of Standards of the United States. Another chapter is devoted to the standardization activities of American technical societies and trade associations. Other features of the book include an abstract of the work in standardization conducted by national standards associations throughout the world and a brief account of international co-operation in standardization.

# THE READER'S PAGE

## Who Can Answer This Question?

To the Editor:

I had occasion recently to remove a 1931 cast-iron wheel on account of brake burn, Rule 75. The brake burns were almost continuous over the entire circumference of the tread but the mate wheel was in perfect shape. The brake rigging was in perfect working order. The beams were suspended from top hanger eyes, and suspended by two spring-type beam supports with sliding chair castings in place. The truck was of the usual four-wheel design. There was no visible evidence of foundry defect. With the weight on shoes being equal, how can one wheel burn and the other remain untouched?

CAR INSPECTOR.

## Repairing Loose Top Arch Bars

To the Editor:

Recently I saw a car foreman directing the efforts of two men while they heated an arch bar with a torch and attempted to pull the bar down by tightening the nut on the column bolt with a wrench. I do not know how general such practice is followed, but when you have a top arch-bar sprung up on account of the nut having lost off the truck-column bolt, or the bolt breaking, the quickest and easiest way to repair it is by using the following procedure:

Jack the body of the car wheel up off the truck. Place a journal jack under the bottom bar and jack the weight of the truck up clear. Then place enough solid blocking on top of the top arch bar to fill the space between the bar and the body bolster of the car. Let off on the car jacks enough to allow the weight of the car to force the arch bar back into its proper position. In placing the journal jack, be careful not to put it where it will be in the way of working the nut on the truck column bolt. Tighten the nut up on the column bolt before removing the blocking or the journal jack.

Perhaps this is old stuff to most of your readers, but then again there might be some who would like to know this.

T. J. LEWIS.

## Spacing Ladder Irons—A Question

To the Editor:

A question relative to the spacing of the top-side and end-ladder irons with that of roof hand holds was brought up at a recent A. R. A. and air-brake meeting. The Safety Appliance Rules are very clear in regard to the minimum and maximum distance of these irons, but measurements are taken from the roof at the eaves of the house car.

It was brought to our attention that on a large num-

ber of the new box and house cars with metal roofs, where a lateral landing board is used, these extend 7 in. to 10 in. above the roofs at the eaves of the cars. In checking up on this question, it was found that in some instances the spacing of the top-side ladder irons and roof hand holds on a vertical plane is as much as 28 in., while the roof hand holds are located back 12 in. from the side and end of the car on the lateral landing board of the house car.

In this case the spacing was 40 in. from the top-side and end ladder irons to the roof hand holds. This, with a short person, is a distance beyond safety. Is there, or is there not, a ruling in regard to any designated distance this lateral board may extend upward from the roof at the eaves, and what is the maximum spacing allowed between these two hand holds?

It was suggested that it might be an oversight in the construction of the car, as nothing can be found in the Safety Appliance Rules governing this particular application.

Any solution to the above will be appreciated.

PAUL DENTON,  
FOREMAN.

[Another letter asking the same question was received from E. V. Carlson. He states: "We are wondering why this rule should not read not more than 18 in. from the roof or eaves, if you can build a latitudinal extension on the top of the roof, thus making the side hand hold 23½ in. to 24 in. from the top of the platform."—Editor]

## An Item Worth Looking Into

To the Editor:

A number of railroads use decking on flat cars, having a square edge, only one side of which is dressed, the dressed side being placed down. A number of railroadmen claim that the rough side up will increase the life of the decking. Now if this is true, why not order the decking standard thickness and not dress either side, thereby saving the labor cost of dressing the lumber as well as material?

There has been considerable argument on this subject and it would be worth while to find out the facts in the case.

I contend that if only one side of the decking is to be dressed, the dressed side should be up to withstand exposure to the weather. The reason is that the rough undressed surface will gather and hold more moisture which will cause the decking to decay much faster, thereby decreasing the life of the decking instead of increasing it. It is argued by some reliable lumber authorities that it will increase the life of such material by placing the dressed side up.

If it is best to show the rough side up and the standard decking to be used is 2½ in., why purchase 3 in. and dress one side? If it is best to show the dressed side up, why not do this and increase the life of the decking 20 per cent, which means approximately \$4 per car?

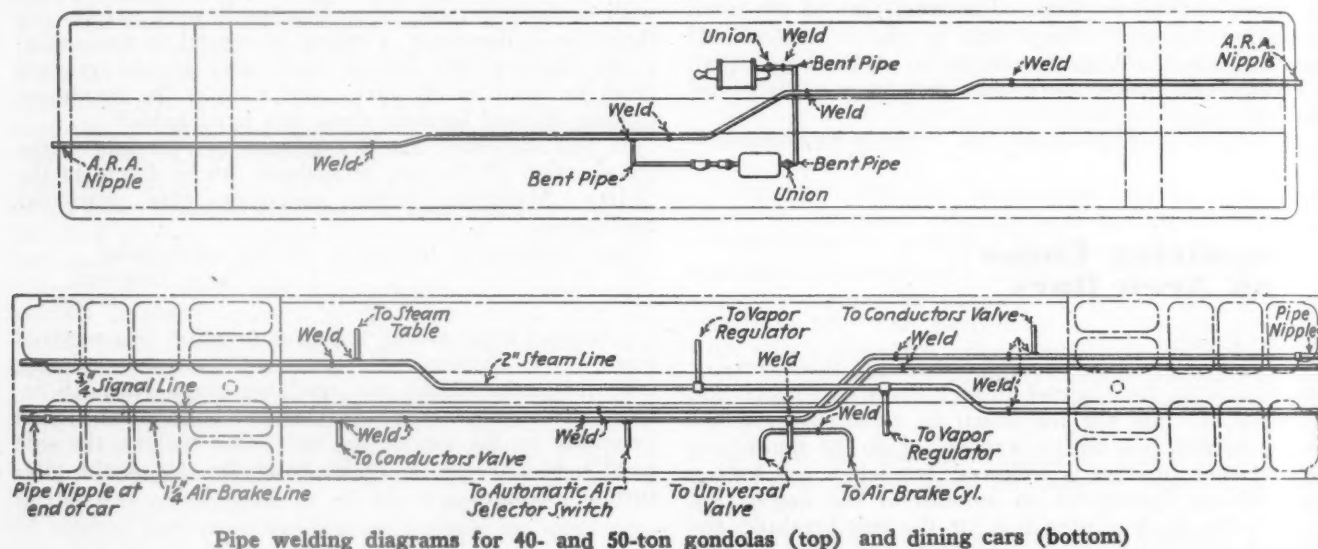
W. H. SHIVER.

# With the Car Foremen and Inspectors

## Welded Piping on Freight and Passenger Cars

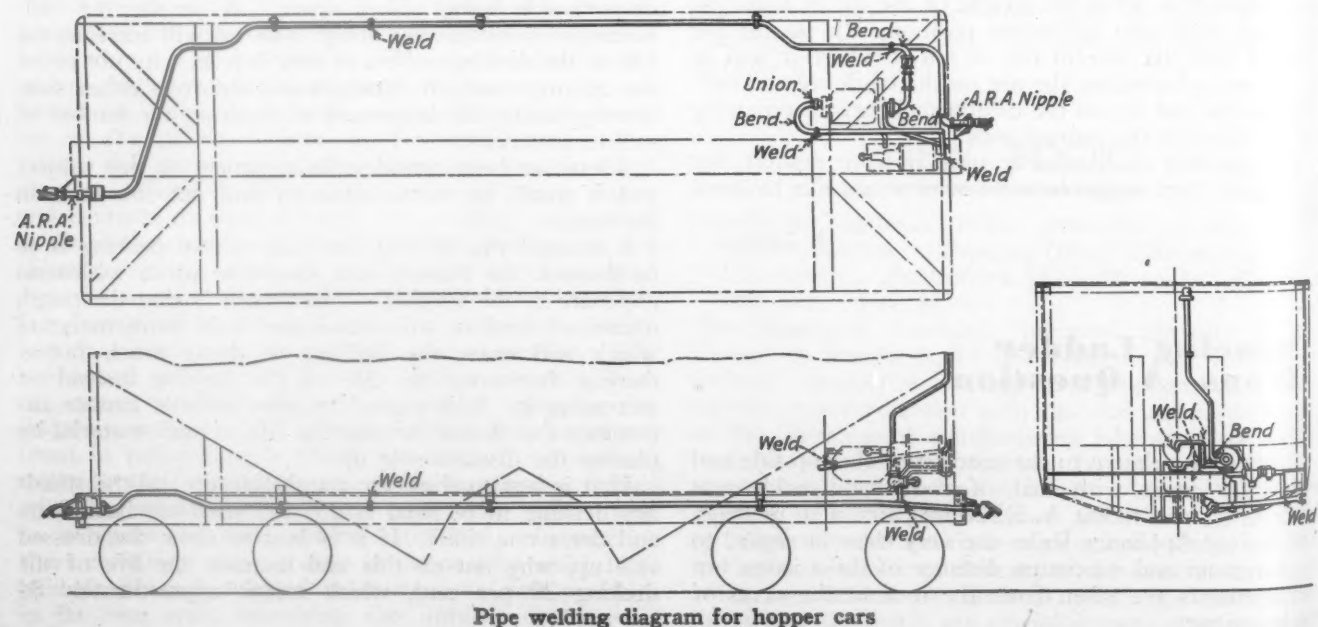
**T**HE Northwest Air Brake Club contributed a paper at the 1928 convention of the Air Brake Association on the subject "Welding Locomotive Air-Piping by the Oxyacetylene Process." An abstract of this paper appeared in the June, 1928, issue of the *Railway Mechanical Engineer*, page 328. It was

standard the practice of welding pipe applied to various types of freight and passenger equipment. The three application drawings show the standard pipe welding diagrams for 40- and 50-ton gondolas, dining cars, and hopper cars. Similar diagrams have also been developed for the application of welded pipe to 30- and 40-ton box cars, passenger-carrying cars, wood baggage cars and combination baggage and mail cars. It will be noted from the drawings that the steam



pointed out in this paper that a representative application of 35 welds in locomotive piping eliminated 26 pipe fittings and 57 threaded joints. As a result of the recommendations in this paper, an eastern railroad, after a number of test applications, adopted as

and signal piping is welded in addition to the air-brake piping. It is estimated that the use of welded joints will prevent at least 25 per cent leakage losses as compared to pipe applied with fittings. By eliminating thread cutting, the service life of the pipe is increased mate-

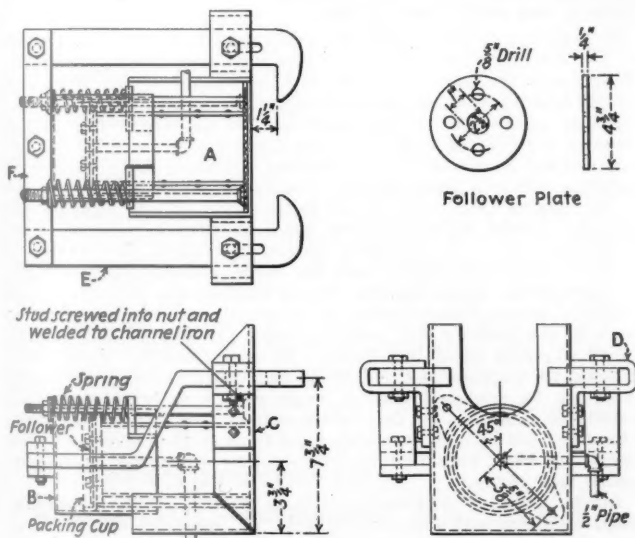


rially, as threads weaken the pipe and are the cause of many failures. There is also a saving of material and a reduction in the number of pipe fittings to be carried in storehouse stock. Welded pipe joints, it is claimed, reduce the amount of pipe maintenance at rip tracks and in car yards, because of the small number of threaded joints to test and tighten.

According to the paper presented by the Northwest Air Brake Club, when pipe is threaded it is weakened by the removal of the protecting coat of mill scale and approximately 30 per cent of the metal. The effect of nicking metal to facilitate breaking is well known. This occurs in each threading operation and is detrimental to the service life of the piping. However, with an oxyacetylene weld, which is usually reinforced slightly, the thickness of the pipe is increased and a protective coat is formed on the outside.

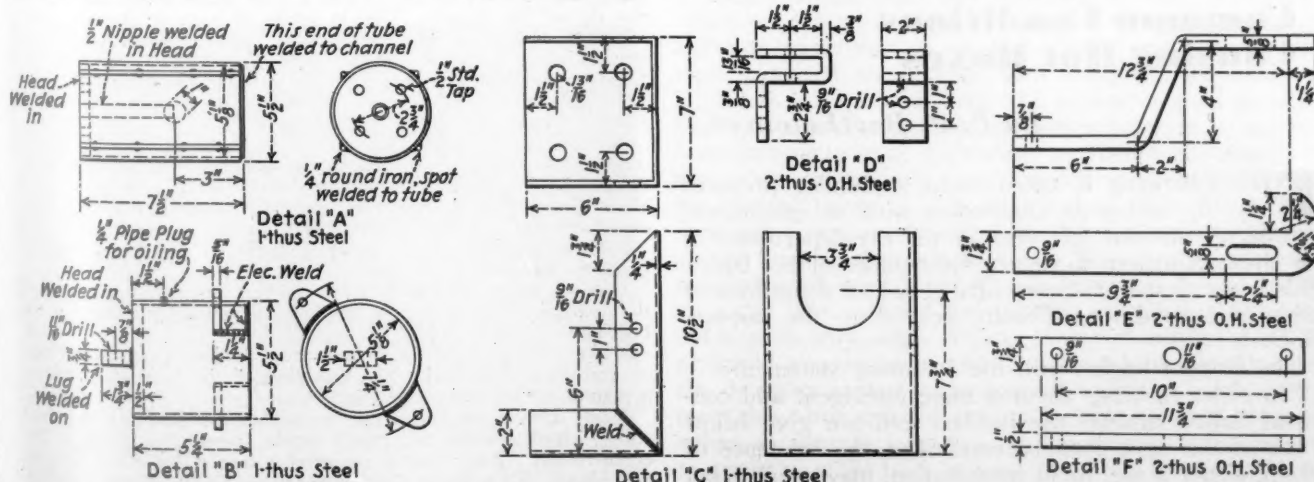
## Pneumatic Clamp for The Triple-Valve Shop

**A** CLAMP for holding a triple valve in a rigid position on the work-bench is a real necessity. To meet this need an air-brake foreman has devised the

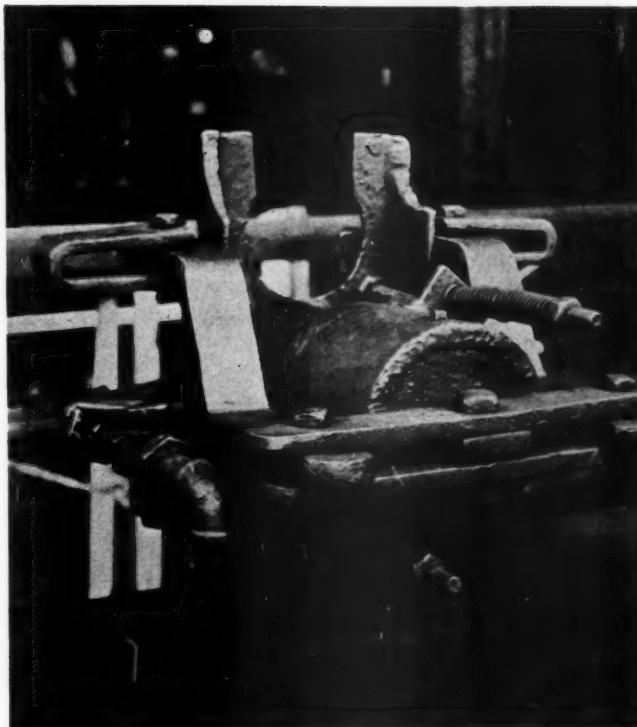


Assembly of the clamp for holding triple valves

pneumatic clamp which is shown in the illustration. The principle of operation is simple. An air-brake repair-



Details of the pneumatic clamp for holding triple valves—The lettered parts refer to the letters on the assembly drawing



The finished clamp mounted on the bench

man can build the entire device with the exception of the welding work.

With this device there is no danger of personal injuries due to the triple valve falling or moving while being repaired as the small cylinder has sufficient force to hold the valve rigid during every repair operation. Neither is there any danger of damaging the seats of the triple-valve body which is usually the case when a hand vise is used for this purpose.

The dimensions shown in the sketch are accurate. If the necessary parts are made according to specifications there will be no difficulty in providing the triple-valve bench with an efficient device.

**NEW CONTAINERS FOR PERISHABLES ON BRITISH ROAD.**—New types of insulated and ventilated containers for handling meat traffic will shortly be introduced by the Great Western of Great Britain. Of the 200 now under construction in Great Western shops, 125 will be of the insulated and 75 of the ventilated type. In the insulated type the top and bottom as well as the walls will be insulated, while the ventilated type is described as "the outcome of months of intensive research."

## Cleaning Window Ventilator Screens

**M**OST of the fresh air that is admitted to Pullman cars during the night when the berths are made up is through the window ventilators. These ventilators are equipped with a fine mesh screen that is easily clogged by cinders and dust and should be cleaned after every trip.

One of these screens is located in the ventilator of each outside window sash. By closing the inside win-



Cleaning sleeping-car ventilator screens by air pressure

dow and with the aid of a 26-in. length of pipe of small diameter attached to the yard air-line hose the screens can be thoroughly cleaned by a car cleaner working from the outside of the car.

After the cinders and other dirt particles are blown from the ventilators, the outside window can be raised and the dirt removed while the inside window glass is being cleaned.

## Common Conditions Causing Hot Boxes

By P. P. Barthelemy\*

**T**HE following is taken from a circular prepared by the author in connection with an educational campaign instituted last year by the car department of the Great Northern to reduce the number of hot boxes. This is the first installment of a series of definitions of terms and conditions directly related to the hot-box problem.

The circular begins with the following statement:

"In order to bring about a more intelligent and concerted action against the hot-box evil we give below a list of the most common conditions, the existence of which, either alone, or in combination, may cause a hot box. Each one connected with the maintenance or

handling of cars is urged to do his share towards the elimination of hot-box trouble."

**Poor oil**—Oil lacking in properties essential to car-journal lubrication.

**Unseasonable oil**—Running summer oil in winter and winter oil in summer.

**Unserviceable oil**—Chiefly second-hand oil that was dirty and has not been properly cleaned before re-using.

**Poor waste**—Waste lacking in resiliency and waste containing considerable loose, short, and unspun fibres, or matted materials.

**Improper packing**—Packing not applied in a thorough and proper manner, leaving portions of the journal without lubricating contact with the packing, or boxes packed too tight or too loose.

**Old packing**—Packing lacking in resiliency, containing much worn fibre and of a dirty and soggy character.

**Dirty and gritty packing**—Due to dust, fine sand, gravel, cinders, etc. finding their way into the box.

**Moisture in packing**—Caused by snow sifting into the box either past the lid or through the dust guard, dust-guard cap, and to water working into the box. This causes the packing to freeze in cold weather when the car is standing, destroys the resiliency of the body of the packing, thus preventing proper lubricating contact and tending to cause a hot box. In mild weather presence of excessive moisture renders packing soggy, thus reducing its lubricating efficiency.

**Glazed packing**—In mild weather, usually because of dirt on the surface of the packing, to lack of sufficient oil, and lack of spooning attention. In cold weather may also be due to an ice glaze on wet and frozen packing.

**Dry packing**—Usually due to syphoning of oil out of the front of the box, absorption of oil by a porous dust guard, syphoning of oil out of the back end of the box, and evaporation. May also be due to a too low oil content in the packing when applied.

**Waste grab**—Part of the body of the packing being caught between the bearing and the journal, preventing local lubrication and causing a dislocation of bearing contacts. This trouble is most prevalent in cold weather, due to the packing being frozen to the journal and working up against the bottom edge of the bearing. Under such conditions when the brakes are applied, or slack runs in or out, or when ears are switched, the bearing is likely to be tilted slightly and the waste caught under its face, or between the collar and the end of the bearing.

**Waste wipe**—This consists of a small pad of fine fibre or hairs in the packing that collects under the side of the bearing, which prevents local lubrication. It is formed by these fibres sticking to the face of the journal and being carried under, and must not be confused with a waste grab. A bright spot will usually be found on the face of the babbitt just back of the wipe. This must not be confused with hard spots in the babbitt. Waste wipes are most prevalent in cold weather when the oil is congealed and sticky.

**Journal scratched**—Usually due to carelessness in handling when applying and removing wheels, or handling wheels about the wheel shops. Before applying wheels the journals should be thoroughly cleaned and the hand carefully passed over the entire face of the journal to be sure that there are no abrasions in the same. In case of abrasions being found they should be removed with a small, fine file. If sandpaper or emery cloth are used, same should be confined to a very small piece, worked on the tip of the finger. This in order to remove the abrasions without destroying the surrounding glazed surface. Wheel sticks, bars, etc. must not be used on the face of journals. Shields should be used when removing and applying side frames with integral journal boxes. When removing and applying the journal box do not permit it to drag on journal.

**Nicked journals**—Usually caused by carelessness in handling unmounted axles, or in permitting journals to be struck by flanges of wheels, etc. Since such nicks produce a raised area about the nick, care must be exercised when removing, to be sure to remove the entire raised area on the face of the journal.

**Journals tapered**—This occurs chiefly in older and lighter capacity journals.

**Journals sprung**—Caused by overloading, or previous heating of the journal. This condition produces a pounding action on the bearing.

**Axles sprung**—Usually the result of a derailment, sometimes on account of overload. The wobbling of the journals produces a pounding that will cause a hot box.

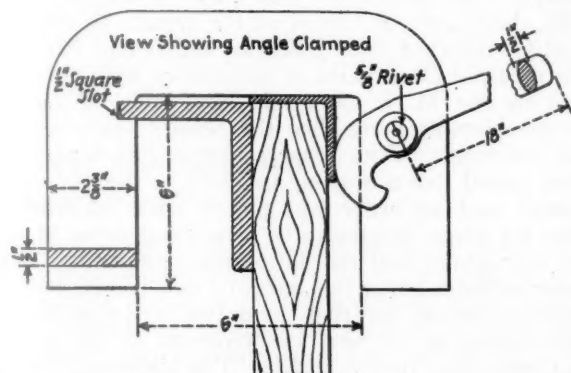
**Rust**—This condition is due to neglect of journals at wheel shops, about storage and repair tracks, permitting them to become rusted. When rust is removed it leaves the surface rough and pitted. To prevent this, journals should be watched and as soon as wheels are removed exposed journals should be greased and kept greased. If rust does occur, it should be carefully removed as mentioned above in connection with scratches.

\* Assistant master car builder, Great Northern, St. Paul, Minn.

## Top-Angle Clamp

IN renewing part or all of the top side planks on composite gondola cars, the protecting angle on the top outside corner frequently becomes distorted and is difficult to re-apply. Even in the case of new angle applications, a light angle extending the full length of the car side has considerable spring and must usually be drawn and held in place by helpers during the drilling and bolting operations.

An effective clamping device which permits one man to do this work is shown in the illustration. It consists



Special clamp used in applying top angles to composite gondola cars

simply of a U-clamp of  $\frac{1}{2}$ -in. by  $2\frac{3}{8}$ -in. section, provided on one side with a  $\frac{1}{2}$ -in. square slot to engage the heavy, inside, top angle and having on the other side a cam and handle pivoted on a  $\frac{5}{8}$ -in. rivet securely fastened in the U-clamp. By the use of the eccentric action of this cam, with a short section of pipe applied to the handle, if necessary, to give increased leverage, even angles which are badly distorted can be gradually brought into line and temporarily bolted for the final drilling and bolting operation.

## Wheelbarrow for Handling Journal Packing

CONSIDERABLE trouble is frequently caused by rain, dirt and cinders getting into car-journal packing during the process of handling around the yard or while packing boxes. Furthermore, it is not always easy



A dope barrow which protects the contents from rain and dirt

to handle packing from an ordinary wheelbarrow to a journal box, and sometimes portions fall on the ground. Unless the box packer has been carefully instructed not to use packing which has fallen on the ground, such packing will get into the box along with all the dirt and cinders it can pick up. Even after careful instructions the temptation to use wet or dirty packing is always present, especially if the supply in the wheelbarrow is insufficient to pack the box, and replenishing the supply means an extra trip to the storage box or barrels.

Appreciating the many factors entering into the job of packing journal boxes, the car department of an eastern road designed the "dope" barrow shown in the illustration. It consists of a box made from a sheet-steel oil drum, tilted as shown, which is mounted on the chassis of an ordinary wheelbarrow of the "dirt" type. The cover for the drum is made to open to the side. It is constructed in the form of a half cylinder and is pivoted to the drum at both ends. A handle is riveted to one side at the center. Thus the cover is lifted by rotating to the high side, as shown. A receptacle is provided over the wheel to carry the bracket and packing irons.

The required amount of dope is taken from the drum and placed in the bracket which sets in the receptacle over the wheel. Transferring the dope from the drum with the bucket in this location prevents loss of dope, as loose portions fall back into the drum or onto the wheelbarrow. The cover can be raised in inclement weather, and dope need only be transferred to the bucket when it is about to be used. Thus the packing can be protected from the time it leaves the storage barrel until it is placed in the box.

## Decisions of Arbitration Cases

*(The Arbitration Committee of the A.R.A. Mechanical Division is called upon to render decisions on a large number of questions and controversies which are submitted from time to time. As these matters are of interest not only to railroad officers but also to car inspectors and others, the Railway Mechanical Engineer will print abstracts of decisions as rendered.)*

### Journal $\frac{1}{32}$ -In. Under Condemning Limit—Credited to Scrap Value

W.S.R.X. car 451 was repaired by the Chicago & Alton on March 3, 1931. A pair of scrap wheels were removed on account of owners' defects, and these wheels were mounted on an axle with a journal diameter of  $5\frac{3}{32}$  in. As the railroad had applied a good second-hand axle, it charged the difference between a second-hand and scrap axle, amounting to \$13.09, claiming that the axle removed was scrapped due to the diameter of the journal being  $\frac{1}{32}$  in. under size. The White Star Refining Company objected to the Chicago & Alton's charge because interpretation 3 of Rule 9 prohibited the measuring of journal lengths in less than sixteenths of an inch. The railroad claimed that this applied to journal lengths only, while the car owner contended that the principle was the same and that the rule would apply to the diameter as well as to journal lengths. In its statement the Alton pointed out that interpretation 3, Rule 9, refers to journal lengths only and cannot be construed to apply to other than journal lengths. Paragraph c of Rule 86 states that an axle cannot be remounted unless the journal diameter is "at least  $\frac{1}{8}$  in. greater than the limiting dimensions shown above." Also, the Alton

pointed out, paragraph d, Rule 86, states that when an axle has been "removed on account of owners defect on a wheel, if the diameter of the journal is not at least  $\frac{1}{8}$  in. greater than the limiting diameter shown, the axle shall be considered as scrap and so credited." The exact journal diameter of the axle removed was shown by the Alton's wheel shop record to be  $5\frac{3}{32}$  in., which diameter is not in excess of the requirements of paragraphs c and d of Rule 86. For these reasons the Alton claimed that its charge had been correctly rendered.

The following decision was rendered: "The position of the Alton is sustained. Section (d) of Rule 86 covers. Interpretation 3 to Rule 9 applies to journal lengths only.—Case No. 1693, *White Star Refining Company vs. Chicago & Alton*.

#### **Damaged Car Interchanged Without Securing Defect Cards**

Atlanta, Birmingham & Coast car No. 27032 was damaged in an accident November 23, 1929, at Paden, Miss., a point on the Illinois Central over which the Mobile & Ohio has trackage rights. After repairs were made by the Mobile & Ohio the car was delivered to the owners in interchange at Birmingham, Ala., February 11, 1930. Inspection was made at the A. B. & C. shops at Elyton February 19, 1930, by the assistant chief joint inspector and five defect cards were issued against the M. & O. for defects in the center sill, side sill, bolsters, body and safety appliances. The sills were reported to be 3 in. and 4 in. out of line by the joint inspector. Joint evidence cards were also issued by the joint inspector for wrong repairs to three brake beams, brake rigging parts, coupler release rigging and body bolster. The car was then moved to the Westwood shops of the A. B. & C. and on March 10, 1930, joint evidence was made out and signed by two inspectors of that railroad for additional damage to the side and end sills, cross-bearer tie plates, and metal side posts. Joint evidence was also made out for additional wrong repairs to one ridge-pole tie plate, carline wooden fillers, ridge-pole space blocks, floor clamps and bolts omitted, latitudinal running boards, and roof. The A. B. & C. rendered a bill against the M. & O. for \$708.12 for the total cost of making repairs. This included all defects covered by the defect cards issued by the joint inspector at Birmingham, and wrong repairs covered by joint evidence at that point, as well as additional damages and wrong repairs covered by joint evidence cards issued by the A. B. & C. at its Westwood shops. Under the provisions of Rule 12 the M. & O. agreed to accept charges for all wrong repairs, but declined to pay for the additional damage authorized by the joint evidence signed by two A. B. & C. inspectors, on the grounds that, under Rule 2, full protection should have been secured for all damage when the car was delivered to the owner through the interchange at Birmingham. Charges rendered for straightening the sills on authority of the defect cards were also declined, the M. & O. claiming that the defects were not sufficiently repaired to warrant a bill. The handling line also declined to accept a charge for one top side bearing, as well as a charge for wrong repairs, which it acknowledged, as the material furnished by the owner was not standard to the car. The M. & O. also offered as evidence the report of a joint inspection made at Atlanta, June 27, 1930, and the report of an A. R. A. mechanical inspector which showed that the sills were  $\frac{1}{8}$  in. to  $\frac{1}{4}$  in. out of line after the car was released from the A. B. & C. shops and that, as complete repairs were not made in

accordance with Rule 94, such charges should not have been assessed against the handling line. The A. B. & C. contended that the A. R. A. rules do not contemplate permitting a railroad to damage a foreign car, deliver this car to the owner, and, because several of the items were overlooked at the point of interchange, to be able to avoid the responsibility of paying for the damage done to the car, even though the complete extent of the damage was not discovered until after the car was taken to the owners' shops where a more careful inspection could be made. The A. B. & C. stated that the car was not in any accident while being moved from Birmingham to Westwood. It also contended that the repairs to the sills, to which the handling line objected, were properly made in accord with Rule 94 and to the best of its ability and that most of the repairs to which the M. & O. objected were billed on actual cost basis. To have repaired these parts in accordance with exceptions taken by the M. & O. would have cost the handling line considerably more than the repairs for which bills were rendered. With respect to the side bearing, the owner stated that a bearing standard to the car was not in stock and an order was placed with the manufacturers for a new bearing to be forwarded to the M. & O. with instructions that the bill be presented to the owner. It was contended that the standard side bearing was not applied to the car and that the defect card was justified.

The following decision was rendered by the Arbitration Committee April 7, 1932: "The additional damage, specified as one bent side plate, two bent end sills, two broken cross-bearer tie plates and two broken metal side posts, determined by inspection at Westwood shops, should have been detected and protection secured at the interchange point. Therefore, bill for these repairs should be withdrawn. Decisions 1525 and 1584 apply. Bill for straightening bent parts on authority of defect cards is proper as repairs were made to the satisfaction of car owner. Both bills for side bearings are sustained, per Rules 87 and 122.—Case No. 1692, *Mobile & Ohio vs. Atlanta, Birmingham & Coast*.

#### **Fails to Furnish Complete Information on Damaged Cars**

Grand Trunk Western steel-frame box car 419396 was moved over the Delaware, Lackawanna & Western from Black Rock, N. Y., to Minooka Junction, Pa., at which point the car was found to have the sills bent and buckled to the extent of Rule 44. The Lackawanna reported the car to the owner according to the provisions of Rule 120, claiming owners' responsibility. The Grand Trunk Western maintained that the statement furnished did not show positively when, where and how the damage occurred. The handling line in its statement contended that an investigation revealed that an extra train, of which this car was a part, had been subjected to an undesired emergency application of the brakes, which brought the train to a rough and abrupt stop. A partial inspection was made by the train crew at the time, but the damage to the sills was not discovered until the car was inspected at Minooka Junction on May 13, 1931. The Lackawanna pointed out in its statement that, although the sills had been damaged, the draft gear and couplers were still able to function. It also stated that the car was of weak and obsolete construction and was not provided with a continuous cover plate and had no reinforcement to the underframe adequate to withstand the stresses of modern train service. In its statement the Grand Trunk Western contended that, although the car had been moved a distance of only  $4\frac{1}{2}$  miles after

the time of the accident and before an inspection was made, and that the car had been switched out of the train at Hampton, Pa., and moved to Minooka Junction, the Lackawanna had failed definitely to establish the exact location and details of the circumstances under which the car was damaged, as is required by Rule 44, interpretation 1. It also stated that a letter from the Lackawanna dated June 15, 1931, acknowledged the fact that the handling line was unable to state positively when, where and how the car was damaged.

The decision rendered by the Arbitration Committee follows: "Inasmuch as the Delaware, Lackawanna & Western did not establish definitely the circumstances under which the damage occurred, it should assume responsibility for the repairs, in accordance with Rule 44."—Case No. 1694, *Delaware, Lackawanna & Western vs. Grand Trunk Western*.

## Two Car-Shop Devices

**T**WO simple devices which facilitate work in the car-repair shop and rip track are shown in the illustrations, the first being a spring-equipped hook for use in moving cars with the car puller, and the second a single spring-type bumper to avoid damage to cars during intershop or rip-track movement without the couplers in place.

Referring to the first illustration, the spring-equipped hook consists simply of an encased spring and I-bolt shock-absorbing unit inserted between the cable and the hook. The spring coil is about 2½ in. in outside diameter and 8 in. in free height, being made of ½-in. round tempered steel. The spring casing is a piece of 3-in. tubing,



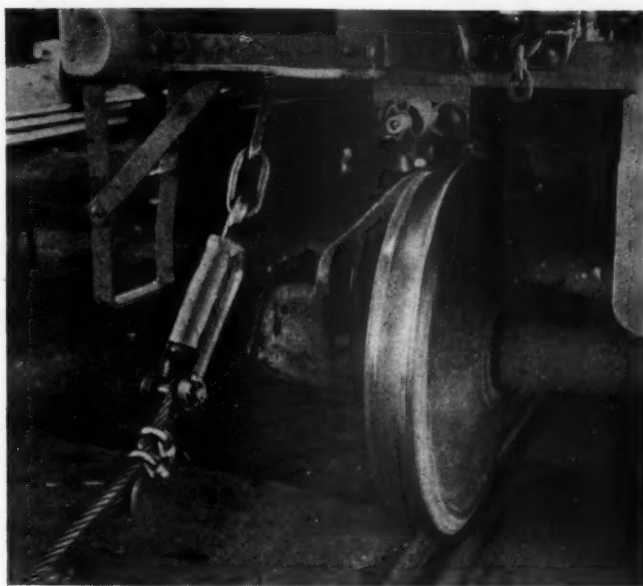
Convenient spring-type bumper for use in intershop movement of cars without coupler and draft-gear protection

12 in. long, to the sides of which are welded two 1-in. I-bolts for attachment to the cable by a pin and two wire rope clamps. A larger I-bolt, made of 1½-in. stock, passes through the casing and spring, being held at one end by a 1¼-in. nut and connected at the other end to a link and the car-puller hook.

The use of this device introduces a shock-absorbing element between the cable and the hook which is attached to the car underframe, the spring having sufficient resilience to transmit the pull from the car puller to the car underframe gradually and avoid the sudden jerk which otherwise might, and frequently does, snap

the cable, break the clamps or damage the car structure at the point of attachment of the hook.

Cars frequently have to be moved on their own wheels about shops and repair tracks with couplers or draft gears and component parts removed for repairs. When thus moved, either by car pullers, tractors or pinch bars, there is considerable danger of the cars' rolling farther than intended and colliding, with resultant



Spring-equipped car-puller hook for use in moving cars at shops and rip tracks

possibility of injuring employees, cutting air-brake hose and breaking the angle cocks or pipe nipples of train lines which have been disconnected.

A special spring bumper, designed to replace the use of ineffective wooden blocks and other intercepting devices, is shown in one of the illustrations. It consists of a 6-in. length of 5-in. superheater flue with a supporting steel strap welded to the top and bent at a right angle so as to engage a cavity in the striking casting and thus hold the bumper in place during movement of the car. This strap is made out of ½-in. by 2½-in. stock, bent to right angles, one leg being 5 in. long and the other 3 in. long, to engage the striking casting. An obsolete draft-gear spring, made of 1½-in. steel, 5 in. in outside diameter and 13 in. in free height, is inserted in this tube section, the outer edges of which are crimped to hold the spring in place.

This spring bumper effectively cushions any light shock, due to the cars coming in contact during movement about the repair shop or rip track, and provides a more convenient and effective means of doing this than would be the case with wood blocks or other substitute material.

**OLD TRAVEL PROBLEM SOLVED.**—A story from Ottawa discloses the manner in which two travelers solved the ancient problem of how to undress in a sleeping car berth with ease, dispatch and without physical torture. These travelers, both middle-aged Englishmen, arrived at the Union Station to take their train, wearing only top coats over their pajamas. They had donned sleeping attire at their hotel and, with porters carrying their baggage, they sauntered through the tunnel to the station and out onto the platform with vast unconcern in spite of the stares of crowds. In addition to their pajamas, one man is said to have worn a light top coat and a derby, while the other had a slightly heavier coat and a cane. Both wore bedroom slippers and a sleepy look.

# In the Back Shop and Enginehouse

## Shrinking in Valve Seats with Liquid Air

By Leland E. Grant\*

**T**HE practical application of aluminum cylinder heads to the engines of gas-electric rail cars, as well as to other automotive equipment, has in part hinged upon a successful solution of the problem of providing satisfactory valve seats. The alloy used for heads has insufficient resistance to stand the pounding of the valves very long, and even with cast-iron heads the early failure of valve seats is not uncommon. This problem has been solved by shrinking in valve seats of aluminum bronze. A detailed description of how these rings are applied to the aluminum heads of gas-electric rail cars in the shops of the Chicago, Milwaukee, St. Paul & Pacific is presented in the following paragraphs:

The gas-electric rail cars are powered with 275 hp. six-cylinder engines the heads of which are in three units. One of these units with its four rings already in place is shown in Fig. 1. As these are overhead valves it is essential that the rings be held firmly in place otherwise they will drop down into the engine. For this reason it has seemed impractical to either screw or pin the rings into place. It has been reported that a combination of these two methods of fastening the rings has been worked out which is satisfactory. The shrinking-in method appeared to be simpler even though

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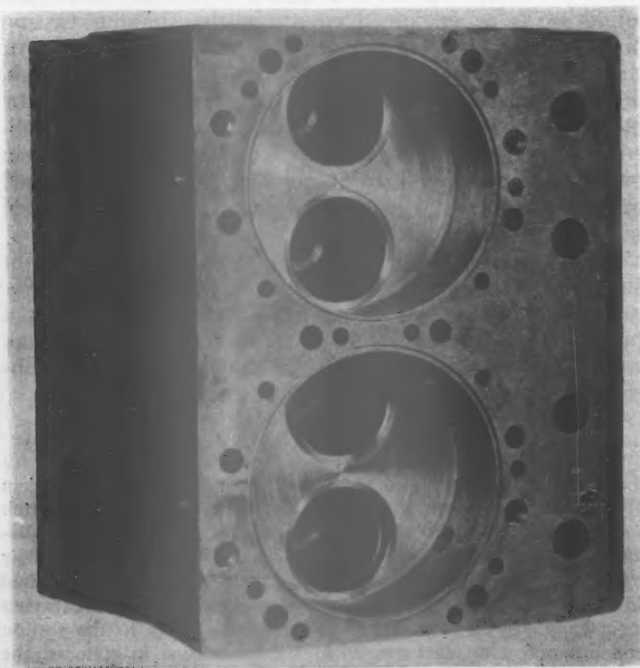


Fig. 1—Head of six-cylinder engine with four rings in place

it does require accurate machining, and this method accordingly was adopted for these engines. Once the proper conditions were determined entirely satisfactory results were obtained.

Liquid air was not used in shrinking in the first aluminum-bronze rings that were applied to these heads. Instead the head itself was heated to about 500 deg. F. and the rings inserted. While this process was satisfactory so far as holding the seat is concerned, it had several disadvantages. In the first place the heads are a special alloy that has to be given a very careful heat treatment to develop the high physical properties. Heating the metal repeatedly will eventually cause a softening and consequently a decrease in the strength. This is undesirable as the alloy does not at its best have any greater strength than is required. Heating may also cause distortion to such an extent that machining is required before the head can be reapplied. A repetition of this will ruin the head altogether. Furthermore, unless the very best equipment is available there is danger that the metal will be heated considerably beyond the required 500 deg. and be ruined entirely. From the standpoint of actual cost it is almost as cheap to cool the relatively small mass of the valve seats by liquid air as it is to heat the much larger mass of metal in the head.

### Method in Shrinking

The principle of the method of shrinking in the seats with liquid air is to cool the rings in this medium to about 300 deg. F. below zero and to heat the head to about 200 deg. in hot water. This provides a temperature differential of 500 deg. which is ample for the purpose. In fact this provides a shrinkage allowance considerably in excess of what it is practical to use. For the heads in question a ring  $3\frac{3}{4}$  in. in diameter is used. The co-efficient of expansion of the metal in the ring is about 0.0000085 per deg. F. Cooling it to 300 deg. F. below zero causes a contraction of 0.012 in. The hole in the head expands 0.007 in. when heated in the hot water making a total theoretical dimensional difference of 0.019 in. Actual measurements made while some rings were being applied showed a difference of 0.023 in. Accepting a modulus of elasticity of 18,000,000 for the aluminum bronze it is seen that on the basis of actual measurement there is possible a stress of 11,000 lb. per sq. in. in rings with the cross section involved.

It would not do to subject the head to any such stress as this, but, even after allowing for some inaccuracy in roundness and some clearance for ease in assembly, it is evident that it is not advisable to take advantage of all of the shrinkage possible. The first rings applied using liquid air had a shrink allowance of 0.012 to 0.013 in. This proved to be too high though there were some other factors involved which were partially responsible for the unsatisfactory results. After these had been in service a short time cracks developed, especially around the exhaust rings. The cracks began at the outer edge of the ring and spread into the body of the casting. In order to overcome this



Fig. 2—Equipment and facilities used for shrinking in valve seats with liquid air

the shrink was reduced to 0.008 in. and the thickness of the ring was also reduced somewhat.

Rings applied under these conditions have given no trouble whatever. The stress is calculated to be about 3,000 lb. per sq. in. For conditions similar to these the proper shrink appears to be 0.0025 in. per in. of ring diameter. If the rings are to be shrunk into cast-iron heads, which is entirely feasible, somewhat more shrink could be allowed but it is not necessary. It must of course be borne in mind that the co-efficient of expansion is less for cast iron than it is for aluminum alloys.

#### Equipment and Facilities Required

Fig. 2 shows the assembly table where the work is done. There is a steel plate mounted on a base to serve as a convenient bench. A steel strap is bolted to this in such a fashion that a head can be placed under it. This strap is used as a fulcrum for a lever, the necessity for which is explained later in this article. Back of the table is a water tank in which two heads can be heated simultaneously. A hoist is provided for lifting the heads from the tank to the table. A small can with a layer of felt insulation is the only additional equipment. The can is  $4\frac{1}{2}$  in. in diameter and holds about one quart of liquid air. A special fixture is used for convenience in inserting the rings. This is shown protruding from the cylinder head in Fig. 2 and in detail in Fig. 3. The "hairpin" that is used is also shown in Fig. 3. The cold ring is picked out of the bath of liquid air with the "hairpin" and then dropped onto the fixture as shown in the photograph. There are two small depressions in the body of the fixture to accommodate the ends of the "hairpin." Three balls are set in the circumference of the holder with springs to hold the balls in place and provide the tension necessary to hold the ring when the fixture is inverted. The end of the fixture is machined to slightly smaller than the hole in the valve stem guides. Thus when the end

of the fixture is set in the valve guide the ring automatically becomes centered. It is only necessary then to press the fixture down firmly and the ring is in place. The lever is applied to hold the ring down as it is believed that there may be some tendency for the ring to be forced up as the head shrinks and the ring expands.

At the start two heads are put into the heating tank and as soon as one is taken out it is replaced by a cold head. In this way one head is always hot and ready for the rings. Four rings, enough for one head, are put in the liquid-air bath to cool. These quickly drop to the temperature of the bath and are then ready to be inserted in the head. Before the finished head is removed from the table to be replaced by another from the hot water tank a set of rings is put into the liquid air to be cooled. Working in this manner no time is wasted and the minimum quantity of liquid air is required. The holes are wiped dry before the rings are put in place and each is tested with a gage to make certain that the dimensions are correct.

#### The Liquid-Air Bath

The quantity of liquid air required will of course vary with the particular conditions but with the procedure outlined here it has been found that one gallon is sufficient for 40 rings or 10 heads. This is approximately eight pounds. The 40 rings will weigh nine pounds. On this basis slightly less than a pound of liquid air is required per pound of metal. At the present price of \$1.25 per liter (one quart) this brings the cost of the liquid air to about 12 cents per ring. The labor charge will be about the same regardless of what method is used where only a few pieces are done at one time. It requires two men from two hours to  $2\frac{1}{2}$  hours to put the rings into 10 heads by the method described. Where a good many pieces are to be handled this method of shrinking in rings will undoubtedly be found to be

quicker as the rings can be cooled in liquid air faster than heads can be heated in a furnace, unless a very large furnace is available.

One of the questions always raised by the workmen is whether or not there is any danger in handling the liquid air. There is danger of course and it is not wise to stick ones hand into the liquid. It seems best to warn the workmen that they are working with a liquid that has all the potential danger that is involved in handling very hot liquids. Long contact with the skin produces a result very similar to burns from hot water. There is, however, the advantage that the liquid air



Fig. 3—"Hairpin" tool for picking rings from the liquid-air bath

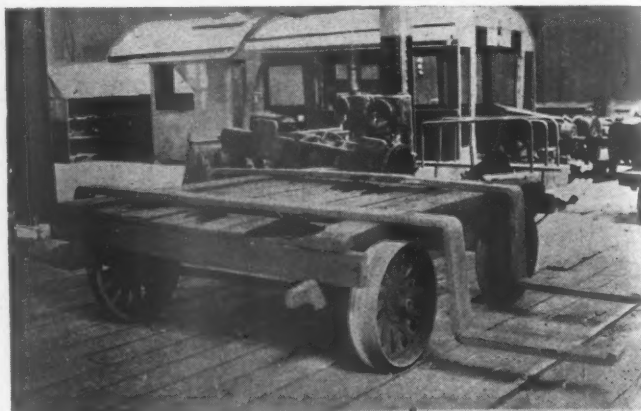
does not wet the skin as easily as water would. Because of its tendency to boil when brought in contact with a warm body it tends to form a layer of the gaseous form (air) under the liquid. For short periods of contact where pressure is absent there is seldom any harm done. But warning the workmen is a wise precaution.

Liquid air is handled in special containers somewhat similar to the ordinary vacuum bottle except they are constructed of metal. And though the evaporation is not extremely high it is more economical to carry out the work immediately after the liquid air is received. The liquid can be kept over night but if this is done an allowance must be made for the loss. When a plant is so located that the liquid air has to be transported some distance the loss involved during the period in transit may be greater than the quantity required for the job in hand. Whether or not liquid air would prove economical in such cases would have to be determined from the various factors involved.

From what has been said above it will be seen that the method of shrinking in valve seats with liquid air is a rapid, relatively cheap, and entirely practical process that gives good results.

## Handling Locomotive Cabs

As a rule the locomotive cab shop is located outside the main shop, but in a building adjacent to the shop. It is usually necessary to handle the cabs to and from the shop. The illustration shows two cab rests which are placed on a four-wheel push truck. They are formed from 1½-in. by 6-in. bar iron and their



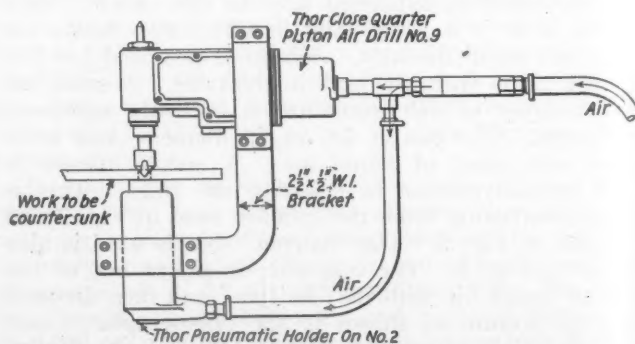
The cab rests on the iron supports placed across the truck length is dependent upon the width of the cabs to be handled. Where a track is available between the main shop and the cab shop the four-wheel push truck can be used. However, if a boardwalk or concrete runway is available the cab rests may be placed on a shop truck.

Of course where the cab shop is located in the main shop the cabs should be delivered by overhead cranes. But where crane service is not available the cabs can be lifted from the locomotive by an overhead crane, loaded on a truck and unloaded in the cab shop with a crane which should be provided for that purpose.

## Countersinking Holes In Flue-Sheet Flanges

A PORTABLE device for countersinking holes in the flange of flue sheets can be readily made from a Thor close-quarter piston air drill and a Thor pneumatic holder-on as shown in the drawing.

The drill and holder-on are securely fastened to-



Combination set-up of Thor No. 9 air drill and No. 2 holder-on for countersinking the holes in flue-sheet flanges

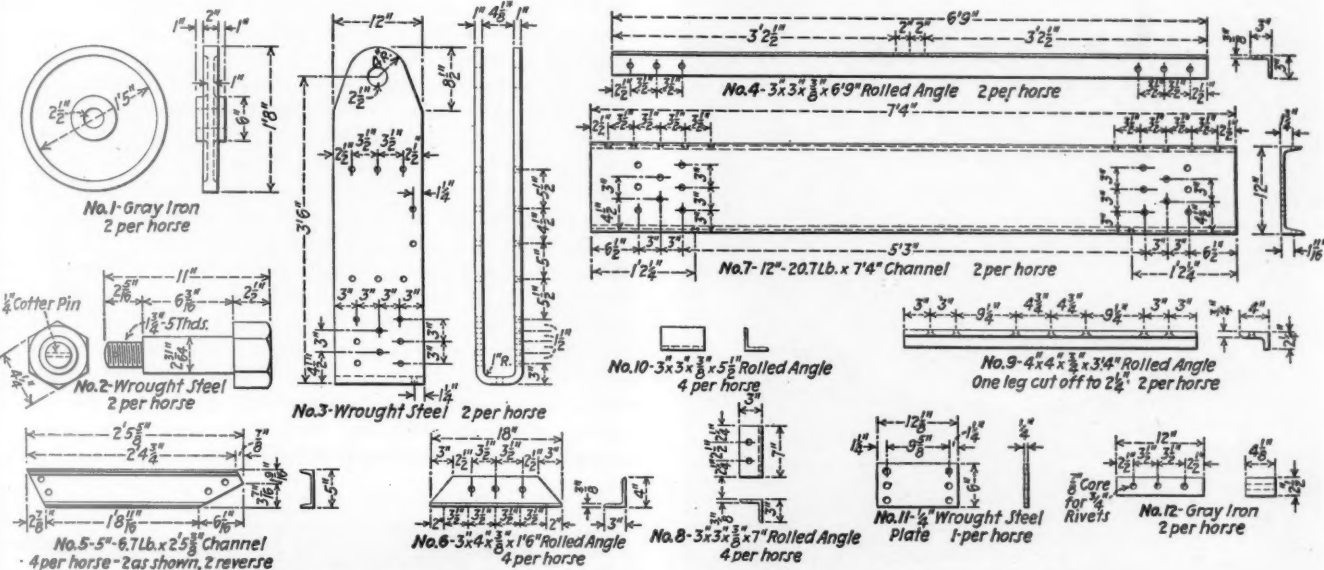
gether by means of a bracket made of ½-in. by 2½-in. wrought iron or steel. A short nipple and tee are placed between the drill and handle. The side outlet of the tee is connected by means of a short hose to the

holder-on. Thus, a turn of the throttle handle starts the countersinking tool and admits air to the holder-on simultaneously.

# A Handy Horse For the Boiler Shop

MOST locomotive boiler repair shops are provided with some sort of device for rotating boiler shells to convenient position for riveting, welding, etc.

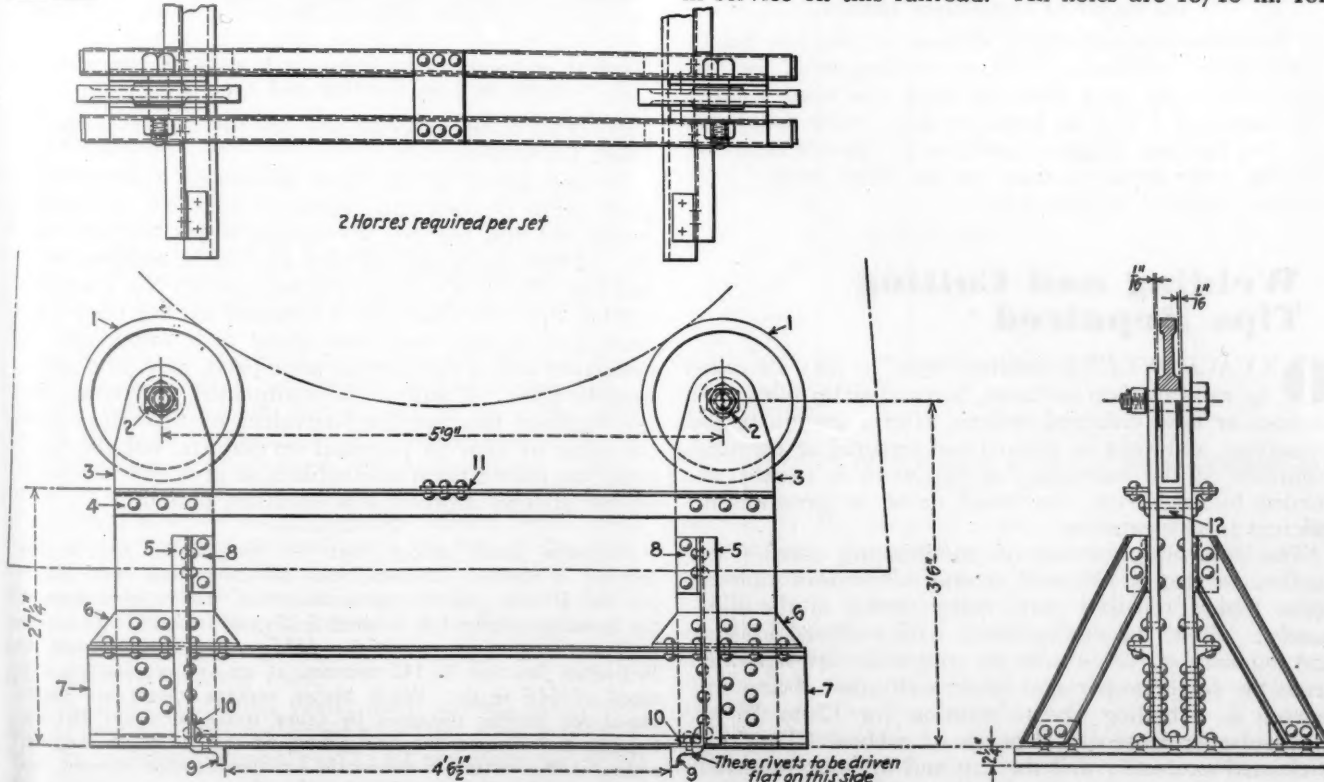
The rollers 1 are grey iron castings, 20 in. in diameter. They are mounted on U-shaped trunnions 3 of 1-in. by 12-in. wrought steel. The trunnions are secured to the foundation cross-channels 7 by 3-in. by 4-in. by 3/8-in. angles 6, 1 ft. 6 in. long. They are formed to the shape of a U, as shown, and extend down between the backs of the cross-channels 7 to the floor plates. The cross-channels 7 are 12-in., 20.7-lb. section, 7 ft. 4 in. long. The trunnion pieces are braced with 5-in., 6.7-lb. channels 5, 2 ft. 5 3/8 in. long, as shown. A cross brace 4 of 3-in. by 3-in. by 3/8-in. angle, 6 ft. 9 in. long, is applied 2 ft. 7 1/4 in. from the floor. The



Details of the horse designed for rotating boilers when riveting or welding

The horse shown in the two drawings and in the illustration on page 472 was designed in the mechanical engineer's office and is used in the boiler shop of an eastern railroad.

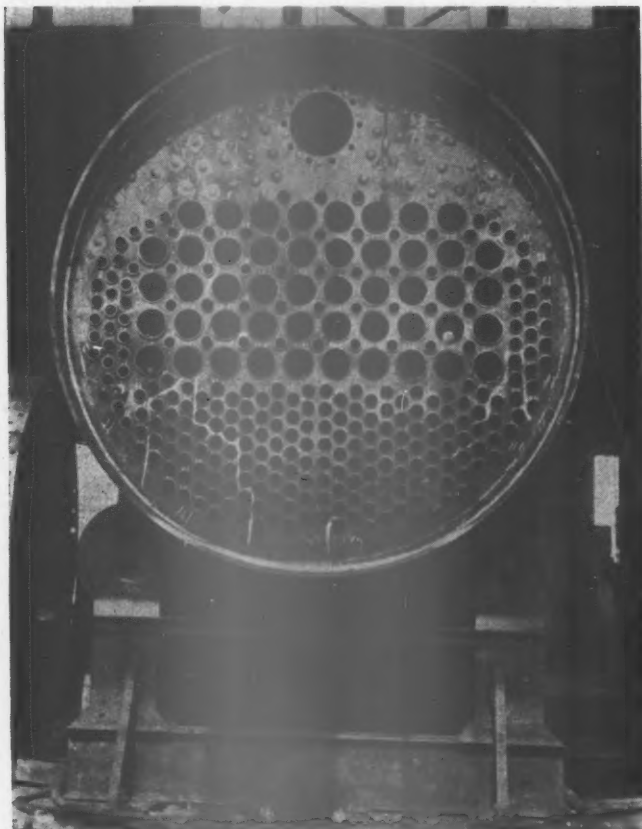
rollers 1 are spaced 5 ft. 9 in. apart, center to center, and this spacing is not adjustable. However, the spacing between the rollers is suitable for the majority of boilers in service on this railroad. All holes are 13/16 in. for



Assembly drawing of the improved boiler-shop horse

$\frac{3}{4}$ -in. rivets. The roller pin 2 is made of a 2-31/64-in. diameter machine bolt, the end of which is cut and threaded for a 1 $\frac{1}{4}$ -in. bolt, secured by a  $\frac{1}{4}$ -in. cotter pin.

This horse supersedes a horse of shop construction. The rollers of the old-type horse were mounted directly



Side view of the improved horse designed for facilitating the repair of locomotive boilers

on the cross channel which, because of the low height, had to be set on blocks to permit the bottom of the fire-box to clear the floor when the shell was being rotated. The height of 3 ft. 6 in. from the floor to the roller axle pin 2 of the new design is sufficient to provide clearance for the wide fireboxes used on the large freight locomotives operated by this road.

## Welding and Cutting Tips Repaired

**O**XACETYLENE welding "tips," as they are called in railway-shop parlance, become dirty, filled with carbon, or have enlarged orifices, after a certain period of service, and must be cleaned and repaired or replaced. Evidence of the necessity for this work is usually afforded by backfiring, shortened flame or generally inefficient torch operation.

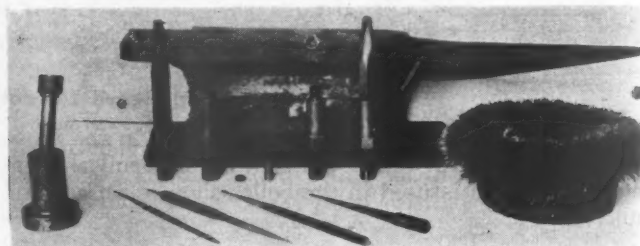
The following method of conditioning torches for further service is followed at one midwestern railroad shop, typical repaired parts being shown in the illustration. First, the mixing head, with enclosed injector and retaining cap screw, and the copper tip, are separated from the torch proper and from each other, being immersed in a boiling Oakite solution for 12 to 18 hr. to dissolve or loosen all deposits of carbon. The head is cleaned externally and the cap and injector removed. The loosened carbon is blown out as thoroughly as pos-

sible with compressed air and any remaining carbon removed with one of the tools shown in the foreground of the illustration.

The copper tip is cleaned inside and out and a special hand reamer used to take off any carbon that sticks to the walls of the mixing chamber. Care is exercised not to remove any metal from the interior walls of the tip. The tip is then lightly swaged on a tapered recess in the anvil shown in the background, until the hole in the extreme end is smaller than when new. This hole is then reamed out to the original size, assuring a round hole of the correct diameter to give the best results with the particular size of welding head and tip being repaired.

The injector is cleaned with a No. 60 wire brush mounted on a motor-driven emery wheel and the carbon removed from the interior with a pointed tool. Care is taken not to enlarge the hole beyond the original diameter and to keep the same injector with the head in which it was originally used. With all parts thoroughly cleaned, the head and tip are re-assembled, ready for further service. They are polished with the wire brush. The bottom of the tip is then faced off slightly with a file and the tip is ready for service.

Oxyacetylene cutting tips, comprising, in the type illustrated, an external shell and an internal nozzle, are also cleaned and repaired in a similar manner. These tips start backfiring and will not maintain a constant flame, once they become dirty. The external shell is swaged in a special die, as shown at the left in the illustration, which slightly and uniformly closes the hole in the end. The internal-nozzle holes are cleared out with



Typical oxyacetylene cutting and welding tips and the tools used in cleaning and repairing them

hand drills to the original size and the tips re-assembled ready for service.

In one month at the shop mentioned, the following parts were cleaned and repaired: Five No. 8 welding heads and tips, five No. 10 welding heads and tips, nine No. 12 welding heads and tips, 27 No. 15 welding heads and tips, 29 No. 2 external cutting tips, 25 No. 2 internal cutting tips and four No. 3 external cutting tips. The total cost of this work was about \$73, which may be compared with a cost for the same parts, new, of approximately \$500. It will not be maintained, of course, that the repaired tips are the equivalent of new tips, from the point of view of potential service life, but the work done has placed them in condition to give effective service for another more or less extensive period.

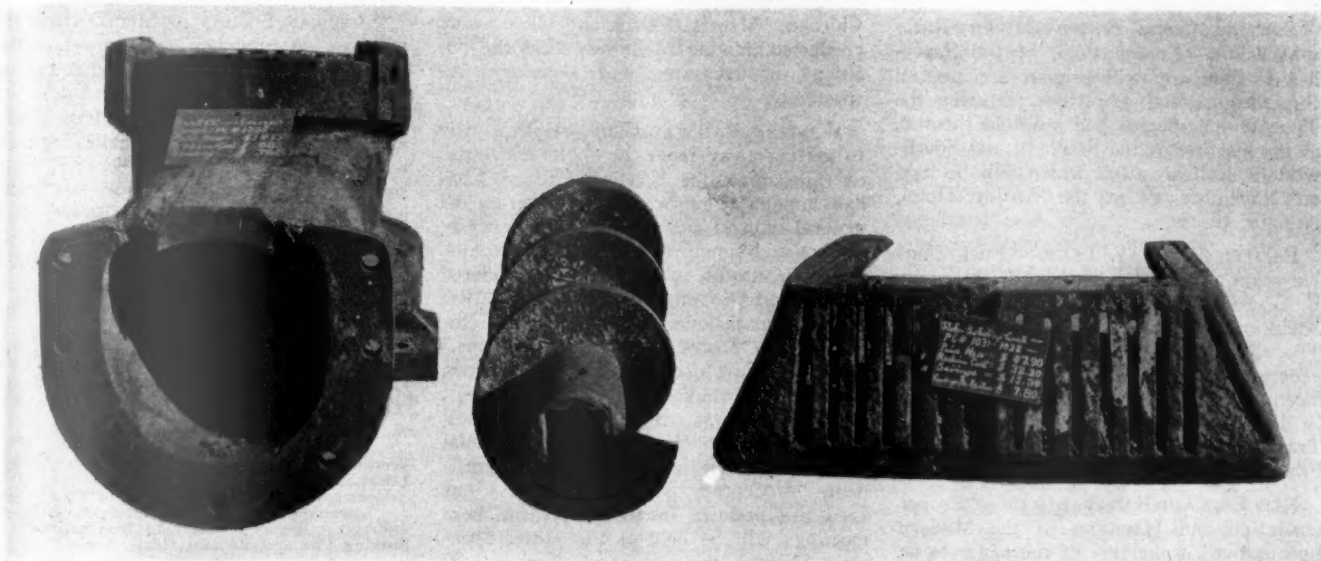
**ANOTHER SPEED RECORD**—that for the fastest start-to-stop run for a distance of more than 150 miles—has been gained for the British railways as a result of the re-scheduling of the Loding, Midland & Scottish 5:25 p.m. express from Liverpool to London to cover the 152.7 miles from Crewe to Willesden Junction in 142 minutes, at an average start-to-stop speed of 64.5 m.p.h. While higher average speeds are maintained for shorter distances by other trains in Great Britain, Canada and France, the new timing of this L. M. S. express makes it the fastest in the world for the distance covered, according to the Railway Gazette (London).

## Repairing Stoker Parts

AS with many other locomotive details, the use of autogenous welding in the repair of stoker parts has effected large economies. Typical examples, shown in the illustrations, include a front-elbow conveyor

## Wrench for Removing and Applying Blow-Off Valves

SHOWN in the sketch is a wrench for removing or applying blow-off valves. The socket is made of soft steel 5 in. long and turned on a lathe to the design shown. It is bored to a depth of 2 in. and made



Conveyor trough, intermediate screw and stoker-protecting grate repaired, ready for further service

trough, an intermediate screw and a stoker-protecting grate in two parts.

The first of these stoker parts, namely the front-elbow conveyor trough, was worn through on the right side and at the top, due to the abrasive action of the coal while being forced through it. The worn sections were cut out and new pieces of steel plate of the required thickness cut, flanged and bronze-welded in place so as to make the casting practically as serviceable as when new. This casting cost \$147 when new and was reclaimed at a cost, including labor, material, stores and shop expense, of \$68, or a saving of \$79.

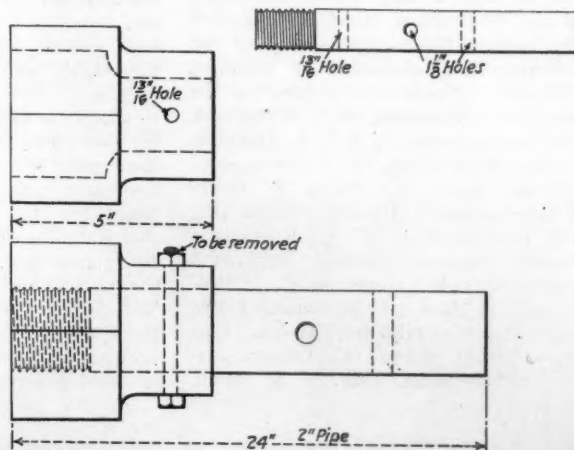
The intermediate-conveyor stoker screw, shown at the center in the same illustration, was badly worn on both the root diameter and the screw blade. All parts were built up and brought back to the original size with the oxyacetylene welding torch, using a steel welding rod. No subsequent machining of the screw was required, in view of the accuracy of the welding work. Similarly, stoker paddles and clevises were reclaimed, using templates to assure the exact duplication of the original size and design.

The illustration shows at the right a two-piece stoker-protecting grate which was broken in two at one corner and had two corner ribs burned out on the other side, due to the high temperature and the abrasive action of fuel particles under high draft or blast conditions. Starting in at the bottom, these grate sections were built up by oxyacetylene welding, gradually adding layer upon layer of the welding material until the top of the grate was reached and the top rim thoroughly welded. Due allowance was made for shrinkage during the welding operation. The welding material used consisted of 90-per cent scrap air-compressor piston rings and 10-per cent cast iron welding rods.

This stoker-protecting grate, made in two parts, cost \$47.90 new and was reclaimed at a total cost of \$32.30, with an indicated saving of \$15.60 per grate, or \$7.80 per section.

hexagon in the smith shop to suit the size of the valve. Care should be taken to have sharp corners in the hexagon socket as it is sometimes necessary to use a hammer on the wrench to loosen the valve so that it will turn.

A 2-ft. length of 2-in. pipe, threaded at one end and drilled for one 13/16-in. hole and two 1 1/8-in. holes as shown, is required. The socket is placed over the hex



Blow-off valve wrench—The socket is made hexagon to suit the valve

portion of the blow-off valve and the 2-in. pipe is screwed into the valve connection with the hands and turned so that the 13/16-in. hole in the pipe coincides with the hole in the body of the socket. A 3/4-in. bolt is then inserted which secures the pipe to the socket so that the two will turn together. A 1-in. iron buggy bar is then inserted through one of the two 1 1/8-in. holes for turning the wrench.

This wrench, which is used in the shops of a southeastern railroad, will not slip off the valve under any condition of service or application.

# Among the Clubs and Associations

**SOUTHERN AND SOUTHWESTERN RAILWAY CLUB.**—George Fogg of the Superheater Company will present a paper on Superheaters and Throttles, featuring the Type E superheater and multiple throttle, at the meeting of the Southern and Southwestern Railway Club which will be held on November 19 at the Ansley Hotel, Atlanta, Ga.

**PACIFIC RAILWAY CLUB.**—"Fuel Conservation" is the topic to be discussed by E. G. Sanders, fuel conservation engineer, Atchison, Topeka & Santa Fe, and R. S. Trogood, assistant engineer, officer of general manager, Southern Pacific, at the meeting of the Pacific Railway Club to be held at 7:30 p. m. in the rooms of the Transportation Club, Palace Hotel, San Francisco, Cal., on November 17.

**NEW ENGLAND RAILROAD CLUB.**—"Proper Operation and Handling of the Modern Locomotive" is the title of the paper to be presented by Ralph Hammond, road foreman of engines of the New York, New Haven & Hartford, at the meeting of the New England Railroad Club which will be held at 6:30 p. m., on November 15 at the Hotel Statler, Boston, Mass.

**CAR FOREMEN'S ASSOCIATION OF CHICAGO.**—L. M. Carlton, mechanical expert of the Westinghouse Air Brake Company, will present a paper on air brakes at the meeting of the Car Foremen's Association of Chicago at 8 p. m. on November 14 at the Auditorium Hotel, Chicago. ¶ At the regular November meeting of the Car Foremen's Association of Chicago, the following officers were elected for the ensuing year: President, M. E. Fitzgerald, general car inspector, C. & E. I., Danville, Ill.; first vice-president, W. J. Owen, chief interchange inspector, Peoria & Pekin Joint Car Inspection Bureau, Peoria, Ill.; second vice-president, F. L. Kartheiser, mechanical inspector, Chicago, Burlington & Quincy, Chicago; treasurer, C. J. Nelson, superintendent of interchange, The Chicago Car Interchange Bureau, Chicago; secretary, George K. Oliver, passenger car foreman, Chicago & Alton,

Chicago. Messrs. Nelson and Oliver were re-elected, having previously held the positions of treasurer and secretary, respectively.

**WESTERN RAILWAY CLUB.**—With a view to getting away from the "bolts and nuts" of railroading, the Western Railway Club has announced a broadened program of general interest and helpfulness to railway officers and supply men in all departments. The schedule of subjects to be considered at the next two meetings of the 1932-1933 season is as follows: Monday evening, November 21, "Stores Department Problems," by D. C. Curtis, chief purchasing officer, Chicago, Milwaukee, St. Paul & Pacific; Monday evening, December 12, Ladies' Night, "Chicago World's Fair Centennial Celebration," by Rufus C. Dawes, president, "A Century of Progress." As has been the practice in former years, these meetings will be held at the Hotel Sherman, Chicago, the regular meeting at 8:00 p. m. being preceded by a Dutch-Treat dinner at 6:30. O. E. Ward, president of the Western Railway Club and superintendent of motive power of the Chicago, Burlington & Quincy, Lines East, reports that special plans have been made in an effort to assure an unusually large attendance and interesting discussion at all meetings. At the opening meeting, October 17, Mr. Rossetter will be introduced by Samuel O. Dunn, editor, Railway Age, and the entire subject of government expenditures and taxation in relation to present railway and general business conditions will be thoroughly presented for the benefit of the members. The social evening of the year, to which the ladies are invited, is scheduled for December 12, and, following the dinner, the present status of plans for the Chicago Centennial Celebration will be presented in detail by Mr. Dawes. It is anticipated that Ralph Budd, president of the Chicago, Burlington & Quincy, will be present at the meeting and will introduce Mr. Dawes. ¶ At the October 17 meeting George W. Rossetter, president, Chicago Chamber of Commerce, discussed the economic situation and government expenditures.

\* \* \*



A freight car for lumber on the Swiss Federal Railroads

**AMERICAN SOCIETY OF MECHANICAL ENGINEERS.**—A number of papers which should be of interest to mechanical department officers are on the technical program for the annual meeting of the American Society of Mechanical Engineers which is to be held December 5-8, inclusive, at the Engineering Societies building, 29 West Thirty-Ninth street, New York. Among them are papers on the Horsepower and Tractive Effort of Steam Locomotives (Locomotive Ratios), by A. I. Lipetz, and Car Construction of the Future, by C. E. Barba. These are to be presented at sessions of the Railroad Division. The program in part, for this and other divisions is as follows:

Monday, December 5  
9 a. m.

Working Stress Symposium  
Locomotives

Horsepower and Tractive Effort of Steam Locomotives (Locomotive Ratios), A. I. Lipetz  
Progress Report of Railroad Division  
Soaking Pits and Radiant Heat

2:30 p. m.

Working Stress Symposium

Factors Affecting Choice of Working Stresses for High Temperature Service, P. G. McVetty

Metals at High Temperature—Test Procedure and Analysis of Test Data, Ernest L. Robinson

Rolling of Metals

Special Design of Cars

Car Construction of the Future, C. E. Barba

Power-Test Public Hearing

Public Hearing on Test Code for Centrifugal Compressors, Exhausters and Fans

Pulsation in Air Flow from Fans and Its Effect on Test Procedure, H. F. Hagen

Influence of Bends in Inlet Ducts on the Performance of Induced-Draft Fans, L. S. Marks, J. Lomax and R. Ashton

Tuesday, December 6  
9:30 a. m.

Working Stress Symposium

Allowable Working Stresses Under Impact, N. N. Davidenkoff

Suggestions on Choice of Working Stresses, C. R. Soderberg

Cutting Metals

Effect of Lathe Cutting Conditions on the Hardness of Carbon and Alloy Steels, T. G. Digges

Materials Handling on Railroads

Materials Handling as a Factor in the Transportation of Commodities, M. W. Potts and J. A. Cronin

Effects of Transportation Requirements on the Evolution of Railroad Equipment, C. B. Peck

Industrial Power

High-Pressure Steam-Generator Research, A. A. Potter, H. L. Solberg, G. A. Hawkins and P. A. Willis

2 p. m.

Cutting of Metals

What Can Be Accomplished with Modern Machine Tools and Cemented-Carbid Cutting Tools, A. A. Merry

Grinding Cemented-Tungsten and Tantalum Carbide Tipped Tools Efficiently and Economically, J. M. Highduchek

Mechanical Springs

Number of Active Coils in Helical Springs, R. F. Vogt

Three Progress Reports of Mechanical Springs Research Committee

Bearings

The Morgoil Roll-Neck Bearing, F. P. Dahlstrom

Strength of Roll Necks, W. Trinks and J. E. Hitchcock

Heat Transmission and Stokers

The Measurement of Metal Temperatures on the Heat-Receiving Side of Heat-Exchanging Apparatus, Arthur Williams

Stoker Development at Delray Power House No. 3, The Detroit Edison Company, Paul Thompson and Fred S. Chatel

8:30 p. m.

President's Night and Conferring of Honors

Wednesday, December 7  
9:30 a. m.

Foundry  
Special Steel for Castings, R. A. Bull  
Malleable Iron as a Component Part of Ma-  
chines and Structures, E. Touceda

Economics  
Surpluses—Their Distribution  
Long-Time Planning—For Individual Concerns  
Trade Associations—Their Services  
Flow Measurement and Hydraulic Design  
Problems of Modern Pump and Turbine De-  
sign, Wilhelm Spannake

2 p. m.

Plant Management  
The Economic Characteristics of the Manu-  
facturing Industries, W. Rautenstrauch  
The Dissolving of Concentrated Industries,  
Harold V. Coes  
Management Essentials for Recovery, Carle M.  
Bigelow

Flow of Fluids  
A Study of the Data on the Flow of Fluids  
in Pipes, Emory Kemler

6:30 p. m.

Annual Dinner, Hotel Astor  
Thursday, December 8  
9:30 a. m.

Aeronautics  
Management Progress  
Ten Years' Progress in Management, L. P.  
Alford

Applications of the Kmh. method of Analyzing  
Manufacturing Operations, L. P. Alford  
and J. E. Hannum

Central-Station Power  
Stresses in Boiler Tubes Subject to High Rates  
of Heat Absorption, Wm. L. DeBaufre

A System for Measurement of Steam with  
Flow Nozzles for Turbine Performance  
Tests, Sanford A. Moss and Wistar W.  
Johnson

Performance of Modern Steam-Generating  
Units, C. F. Hirschfeld and G. U. Moran

2 p. m.

Education and Training for the Industries  
The Engineer's Interest in Foreman Training,  
Edward S. Cowdrick

Fundamentals of Training, G. Guy Via  
Adult Technical Education, Ovid W. Eshbach

Lubrication Testing  
Some Problems on the Lubrication of Vertical  
Journal Bearings, A. I. Ponomareff and  
E. D. Howe

Chemistry of Lubrication, W. F. Parish and  
Leon Cammen

Progress Report of Petroleum Division

PURCHASES AND STORES DIVISION.—Sub-  
jects for the committee work of the Pur-  
chases and Stores division, American Rail-  
way Association, and the personnel of all

committees, have been selected and com-  
mittees assigned to commence the prepara-  
tion of their reports for the next annual

convention, according to an announcement  
of W. J. Farrell, secretary. New com-  
mittees on "New Ideas and Economies,"

"Purchase of Special Devices and Com-  
modity Purchases" and "Material Guar-

tees" have been created and new chairmen  
assigned to several standing committees.  
¶Some of the committees and chairmen  
appointed are as follows:

Purchasing and Stores Department Manual—  
Recommended Rules and Practices: H. R. Toohey,  
inspector of stores, C. M. St. P. & P.—chairman.

Classification of Material: D. H. Reed, travel-  
ing storekeeper, Southern—chairman.

Recovery, Repair and Reclamation of Dis-  
carded Material—Classification Handling and Sale  
of Scrap: J. J. Collins, foreman, scrap and  
reclamation plant, Erie—chairman.

Comparisons of Material Stock Reports and  
Stores Expenses: O. A. Donagan, general store-  
keeper, B. & M.—chairman.

Control of Shop Manufacturing Orders for  
Stock Material: G. J. Hunter, traveling material  
supervisor, Santa Fe—chairman.

Control of Material Stocks and Coordinating  
Procurement with Actual Needs: J. V. Miller,  
assistant general storekeeper, C. M. St. P. & P.  
—chairman.

Economical Handling of Materials—Protection  
from Deterioration: J. G. Stuart, assistant pur-  
chasing agent, C. B. & O.—chairman.

Standardization and Simplification of Stores  
Stocks: J. L. Sullivan, division storekeeper, U. P.  
—chairman.

Capacity Loading and Prompt Handling of  
Company Material Cars: J. S. Genther, general  
storekeeper, L. & N. E.—chairman.

Joint Committee on Metric System: J. W.  
Gerber, general storekeeper, Sou.—chairman.

New Ideas and Economies: A. N. Laret, as-  
sistant to vice-president, Frisco—chairman.

Purchase of Special Devices and Commodity  
Purchases: P. L. Grammer, assistant purchasing  
agent, Penna.—chairman.

Exchange of Surplus Material: A. W. Munster,  
purchasing agent, B. & M.—chairman.

Inspection of Materials: J. J. Bennett, pur-  
chasing agent, I. C.—chairman.

Material Guarantees—General Practice as to  
Guarantees—Failures—Methods of Handling: M.  
E. Towner, general purchasing agent, W. Md.  
—chairman.

Joint Committee on Reclamation: I. C. Bon,  
superintendent of reclamation, Wabash—chair-  
man.

Subjects: C. E. Walsh, purchasing agent,  
Penna.—chairman.

Annual Contest: J. C. Kirk, assistant general  
storekeeper, C. R. I. & P.—chairman.

Committees: A. L. Sorensen, manager of stores,  
Erie—chairman.

Nominating: W. Davidson, general storekeeper,  
I. C.—chairman.

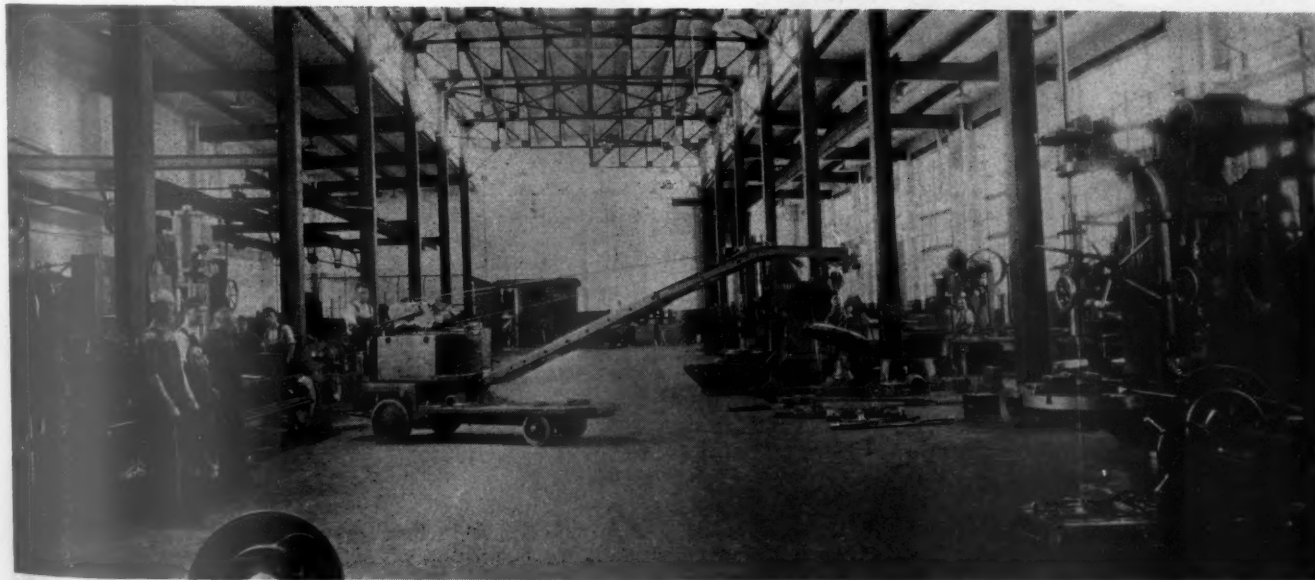
## Club Papers

### Steel Castings and Car-Repair Costs

EASTERN CAR FOREMEN'S ASSOCIATION.  
—Meeting held at the Engineering So-  
ciety's building, 29 West Thirty-ninth  
Street, New York. Subject, Steel Cast-  
ings and Car-Repair Costs, by William

M. Sheehan, manager eastern district  
sales, General Steel Castings Corporation,  
Eddystone, Pa. ¶Mr. Sheehan in discuss-  
ing maintenance economies in the use of  
steel castings in car construction referred  
to the application of two cast-steel frames  
to locomotive tenders on the New Jersey  
Central in 1907. After 20 years of con-  
tinuous use these two frames were removed  
from service and now form part of an  
historical exhibit which the General Steel  
Castings Corporation maintains at its  
Granite City, Ill., plant. Careful exami-  
nation, Mr. Sheehan said, disclosed that  
no noticeable deterioration had taken place  
in all that time, this despite the fact that  
the tenders had been operated along the  
Atlantic seaboard adjacent to salt water  
and subject at all times to the action of  
sulphuric acid brought about by the coal  
and water carried in the tender. The sili-  
ceous coating of molding sand fused into  
the surface of the steel at the time of  
manufacture was still intact. In 1899 the  
first cast-steel double-body bolster was  
applied to a passenger car and was in ex-  
cellent condition when removed in 1917.  
The first cast-steel trucks to be made for  
passenger service were applied to cars on  
the Santa Fe in 1904. These trucks had  
cast-steel equalizers and are still in serv-  
ice. The initial application of six-wheel  
trucks to a passenger car was made by  
Pullman in 1905. These trucks used  
M. C. B. cast-iron pedestals, with drop  
equalizers, and had outside side bearings.  
This general type, Mr. Sheehan stated,  
was standard until about five years ago  
when the trend to integral type passenger  
trucks began. Referring to a discussion  
of freight-car repair costs with the head  
of the mechanical department of a large  
eastern railroad, Mr. Sheehan quoted this  
officer as stating that truck maintenance  
was formerly the highest item of expense  
on a freight car. However, this expense  
has been steadily reduced until now the  
two major parts having the least upkeep  
are the cast-steel side frame and bolster.  
This officer also stated that the highest  
maintenance was in the fabricated under-  
frame.

\* \* \*



View in the machine bays of the Hamilton, Ont., shops of the Toronto, Hamilton & Buffalo

## A Canadian Problem in Statecraft

**NEW ENGLAND RAILROAD CLUB.**—Meeting held at the Hotel Statler, Boston, Mass., October 11, 1932. Subject, A Problem in Statecraft, by D. Crombie, chief of transportation, Canadian National Railways. [This meeting was "Canadian Night" for the New England Railroad Club. Mr. Crombie reviewed the past history of the Canadian National and pointed out that of the twelve lines which were taken over by the government to form the Canadian National, ten were bankrupt private lines and two were state-owned and operated lines. Instead of going through a receivership, the government fully protected the bonds of all twelve railroads issued since 1850, but instead of absorbing these obligations the government made them a part of the Canadian National's debt. In addition, the Canadian government permitted all of the railway deficits incurred during the World War to remain a charge on the railways. [This accumulated burden of 65 years of misdeeds under personal ownership, Mr. Crombie said, and this transference to the Canadian National of war-time railway deficits properly chargeable to the state, started the railway off in 1923 with \$30,158,000 interest charges annually due the government and \$30,158,000 interest on \$823,000,000 of securities held by the public. This \$35,000,000 now for 1931 amounts to \$55,000,000 due the public and the railways' problem is how to increase a normal net of \$47,000,000 to meet fixed charges of \$55,000,000. [In his paper Mr. Crombie pointed out that parts of the Canadian National's 23,000 miles of track are laid in twelve states of the United States and serve all nine of the Canadian provinces. Six hundred thirty-five miles of the Canadian National's lines serve a large number of New England states to the north and northwest.

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The Galesburg, Ill., steel-car shops of the Burlington showing the pneumatic crane equipment

## Directory

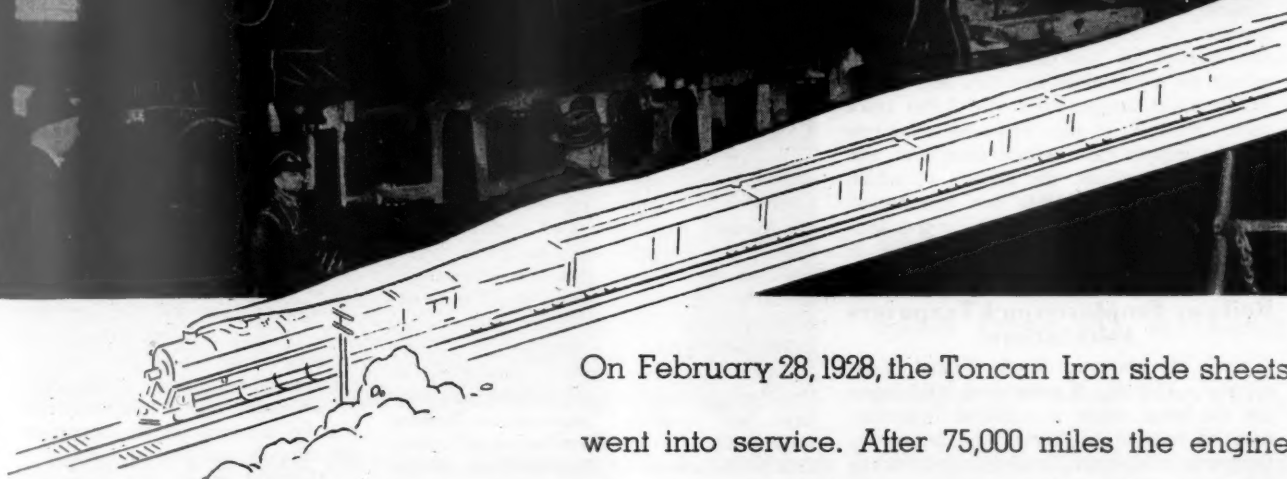
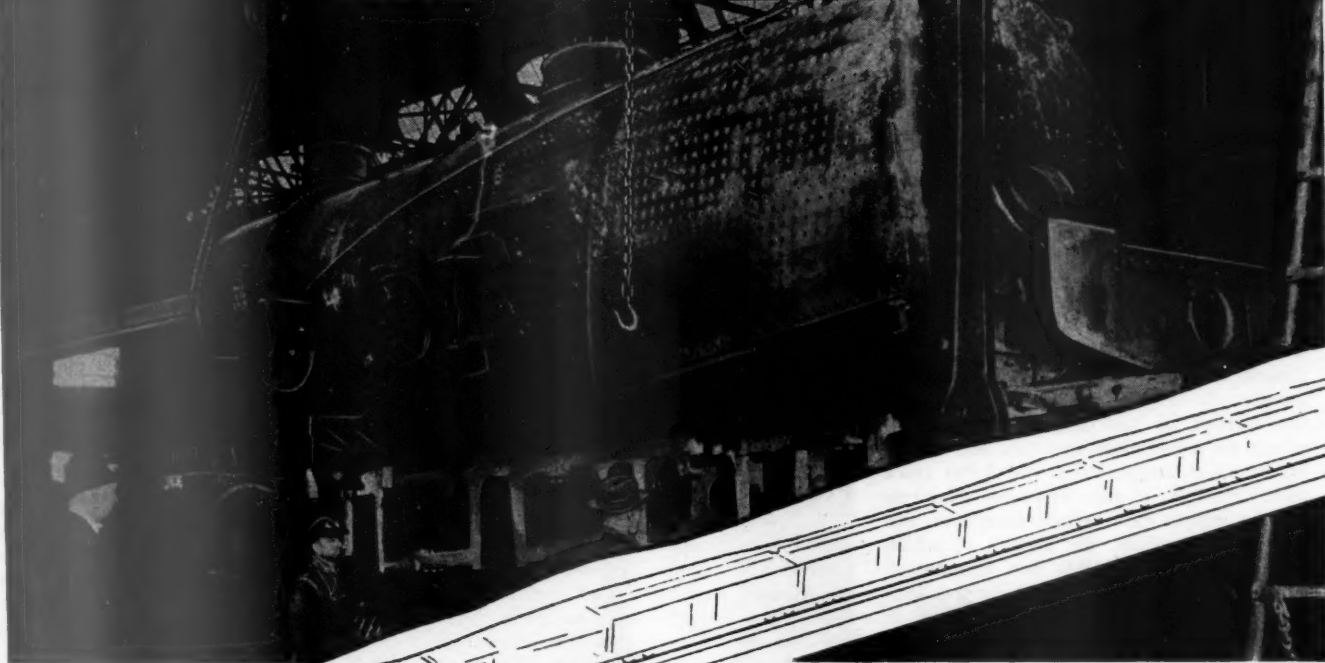
The following list gives names of secretaries, dates of next or regular meetings and places of meeting of mechanical associations and railroad clubs:

- AIR-BRAKE ASSOCIATION.**—T. L. Burton, Room 5605 Grand Central Terminal Building, New York.
- ALLIED RAILWAY SUPPLY ASSOCIATION.**—F. W. Venton, Crane Company, Chicago.
- AMERICAN RAILWAY ASSOCIATION.**—DIVISION V.—MECHANICAL.—V. R. Hawthorne, 59 East Van Buren street, Chicago.
- DIVISION V.—EQUIPMENT PAINTING SECTION.**—V. R. Hawthorne, Chicago.
- DIVISION VI.—PURCHASES AND STORES.**—W. J. Farrell, 30 Vesey street, New York.
- DIVISION I.—SAFETY SECTION.**—J. C. Caviston, 30 Vesey street, New York.
- DIVISION VIII.—CAR SERVICE DIVISION.**—C. A. Buch, Seventeenth and H streets, Washington, D. C.
- AMERICAN RAILWAY TOOL FOREMEN'S ASSOCIATION.**—G. G. Macina, 11402 Calumet avenue, Chicago.
- AMERICAN SOCIETY OF MECHANICAL ENGINEERS.**—Calvin W. Rice, 29 W. Thirty-ninth street, New York.
- RAILROAD DIVISION.**—Marion B. Richardson, associate editor, *Railway Mechanical Engineer*, 30 Church street.
- MACHINE SHOP PRACTICE DIVISION.**—R. E. W. Harrison, 6373 Beechmont avenue, Mt. Washington, Cincinnati, Ohio.
- MATERIALS HANDLING DIVISION.**—M. W. Potts, Alvey-Ferguson Company, 1440 Broadway, New York.
- OIL AND GAS POWER DIVISION.**—Edgar J. Kates, 1350 Broadway, New York.
- FUELS DIVISION.**—W. G. Christy, Department of Health Regulation, Court House, Jersey City, N. J.
- AMERICAN SOCIETY FOR STEEL TREATING.**—W. H. Eisman, 7016 Euclid avenue, Cleveland, Ohio.
- AMERICAN SOCIETY FOR TESTING MATERIALS.**—C. L. Warwick, 1315 Spruce street, Philadelphia, Pa. Annual meeting June 20-24, Haddon Hall, Atlantic City, N. J.
- AMERICAN WELDING SOCIETY.**—Miss M. M. Kelly, 29 West Thirty-ninth street, New York.
- ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS.**—Joseph A. Andrucci, C. & N. W., Room 411, C. & N. W. Station, Chicago, Ill.
- CANADIAN RAILWAY CLUB.**—C. R. Crook, 2276 Wilson avenue, Montreal, Que. Regular meetings, second Monday of each month except in June, July and August at Windsor Hotel, Montreal, Que.
- CAR DEPARTMENT OFFICERS ASSOCIATION.**—A. S. Sternberg, master car builder, Belt Railway of Chicago.

- CAR FOREMEN'S ASSOCIATION OF CHICAGO.**—G. K. Oliver, 2514 West Fifty-fifth street, Chicago. Regular meetings, second Monday in each month except June, July and August, Auditorium Hotel, Chicago, Ill.
- CAR FOREMEN'S ASSOCIATION OF OMAHA.** Council Bluffs and South Omaha Interchange.—Geo. Krieger, car foreman, Chicago, Burlington & Quincy, Sixteenth avenue and Sixth street, Council Bluffs, Iowa. Regular meetings, second Thursday of each month at Council Bluffs.
- CENTRAL RAILWAY CLUB OF BUFFALO.**—M. D. Reed, Room 1817, Hotel Statler, Buffalo, N. Y. Regular meeting, second Thursday each month, except June, July and August, at Hotel Statler, Buffalo.
- CINCINNATI RAILWAY CLUB.**—D. R. Boyd, 2920 Utopia Place, Hyde Park, Cincinnati. Regular meeting, second Tuesday, February, May, September and November.
- CLEVELAND RAILWAY CLUB.**—F. B. Frericks, 14416 Alder avenue, Cleveland, Ohio. Meeting second Monday each month, except June, July and August, at the Auditorium, Brotherhood of Railroad Trainmen's building, West Ninth and Superior avenue, Cleveland.
- EASTERN CAR FOREMEN'S ASSOCIATION.**—E. L. Brown, care of the Baltimore & Ohio, Staten Island, N. Y. Regular meetings, fourth Friday of each month, except June, July, August and September.
- INDIANAPOLIS CAR INSPECTION ASSOCIATION.**—P. M. Pursian, chief clerk to superintendent of shops, C. C. & St. L., Beech Grove, Ind. Regular meetings first Monday of each month, except July, August and September, at Hotel Severin, Indianapolis, at 7 p. m. Noon-day luncheon, 12:15 p. m. for Executive Committee and men interested in the car department.
- INTERNATIONAL RAILROAD MASTER BLACKSMITH'S ASSOCIATION.**—W. J. Mayer, Michigan Central, 2347 Clark avenue, Detroit, Mich.
- INTERNATIONAL RAILWAY FUEL ASSOCIATION.**—T. D. Smith, 1660 Old Colony building, Chicago.
- INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.**—William Hall, 1061 W. Wabasha street, Winona, Minn.
- MASTER BOILERMAKER'S ASSOCIATION.**—A. F. Stiglmeier, secretary, 29 Parkwood street, Albany, N. Y.
- NATIONAL SAFETY COUNCIL.—STEAM RAILROAD SECTION.**—W. A. Booth, Canadian National, Montreal, Que.
- NEW ENGLAND RAILROAD CLUB.**—W. E. Cade, Jr., 683 Atlantic avenue, Boston, Mass. Regular meeting, second Tuesday in each month, excepting June, July, August and September, Hotel Statler, Boston.
- NEW YORK RAILROAD CLUB.**—D. W. Pye, Room 527, 30 Church street, New York. Meetings, third Friday in each month, except June, July and August, at 29 West Thirty-ninth street, New York.
- NORTHWEST CAR MEN'S ASSOCIATION.**—E. N. Myers, chief interchange inspector, Minnesota Transfer Railway, St. Paul, Minn. Meeting first Monday each month, except June, July and August, at Minnesota Transfer Y. M. C. A. Gymnasium building, St. Paul.
- PACIFIC RAILWAY CLUB.**—W. S. Wollner, P. O. Box 3275, San Francisco, Cal. Regular meetings, second Thursday of each month in San Francisco and Oakland, Cal., alternately.
- RAILWAY BUSINESS ASSOCIATION.**—P. H. Middleton (Treas. and Asst. Sec.), First National Bank building, Chicago.
- RAILWAY CAR MEN'S CLUB OF PEORIA AND PEKIN.**—C. L. Roberts, R. F. D. 5, Peoria, Ill.
- RAILWAY CLUB OF PITTSBURGH.**—J. D. Conway, 1841 Oliver building, Pittsburgh, Pa. Regular meeting fourth Thursday in month, except June, July and August, Ft. Pitt Hotel, Pittsburgh, Pa.
- RAILWAY FIRE PROTECTION ASSOCIATION.**—R. R. Hackett, Baltimore & Ohio, Baltimore, Md.
- RAILWAY SUPPLY MANUFACTURERS' ASSOCIATION.**—J. D. Conway, 1841 Oliver building, Pittsburgh, Pa. Meets with Mechanical Division and Purchases and Stores Division, American Railway Association.
- SOUTHERN AND SOUTHWESTERN RAILWAY CLUB.**—A. T. Miller, P. O. Box 1205, Atlanta, Ga. Regular meetings third Thursday in January, March, May, July, September and November. Annual meeting third Thursday in November, Ansley Hotel, Atlanta, Ga.
- SUPPLY MEN'S ASSOCIATION.**—E. H. Hancock, treasurer, Louisville Varnish Company, Louisville, Ky. Meets with Equipment Painting Section, Mechanical Division American Railway Association.
- TORONTO RAILWAY CLUB.**—N. A. Walford, district supervisor car service, Canadian National, Toronto, Ont. Meetings first Friday of each month, except June, July and August.
- TRAVELING ENGINEER'S ASSOCIATION.**—W. O. Thompson, 1177 East Ninety-eighth street, Cleveland, Ohio.
- WESTERN RAILWAY CLUB.**—J. H. Nash, 1101 Peoples Gas building, Chicago. Regular meetings third Monday in each month except June, July, August and September.

(Turn to next left-hand page)

# AFTER 186,152 MILES THE TONCAN IRON SIDE SHEETS ARE STILL GOOD



On February 28, 1928, the Toncan Iron side sheets went into service. After 75,000 miles the engine

was shopped. « With common steel side sheets, over 75% are usually renewed at this time since they often fail to last an additional shopping. « But every Toncan Iron sheet remained in service. On May 1, 1932, the engine was again inspected and all the Toncan Iron sheets are still in sound condition after 186,152 miles of service. « Superior resistance of Toncan Iron to corrosion and fire-cracking makes this modern alloy of copper, molybdenum and refined iron the preferred material for firebox sheets.

Toncan Iron Boiler Tubes, Pipe, Plates, Culverts, Rivets, Staybolts, Tender Plates and Firebox Sheets • Sheets and Strip for special railroad purposes • Agathon Alloy Steels for Locomotive Parts • Agathon Engine Bolt Steel • Agathon Iron for pins and bushings • Agathon Staybolt Iron • Climax Steel Staybolts • Upson Bolts and Nuts • Track Material, Money Guard Rail Assemblies • Enduro Stainless Steel for dining car equipment, for refrigeration cars and for firebox sheets • Agathon Nickel Forging Steel (20-27 Carbon).  
The Birdsboro Steel Foundry & Machine Company of Birdsboro, Penna., has manufactured and is prepared to supply under license, Toncan Copper Molybdenum Iron castings for locomotives.

## REPUBLIC STEEL

C O R P O R A T I O N

GENERAL OFFICES — R — YOUNGSTOWN, OHIO



# NEWS

## N. Y. C. Application Granted

THE NEW YORK CENTRAL application to the Reconstruction Finance Corporation for a "work loan" of \$2,500,000 for the purpose of repairing equipment in its own shops was approved by the Interstate Commerce Commission on November 1. The work contemplated consists of repairs to 10,000 steel box cars, at an average estimated cost of \$150 per car, and repairs to 3,000 automobile box cars, at an average exceeding \$300 per car. For the first-named group the repairs would include floors, linings, running gear, and painting, and, in the second group, draft gears and the application of new roofs. It was estimated that the work would require about 1,500 men for seven or eight months, on the basis of 40 hours of labor per week. The company requested permission, if conditions should be found to require it, to modify the foregoing program, reducing the number of box cars to 7,500, eliminating the automobile box cars and substituting 4,000 hopper cars and 1,000 stock cars. Further, it may desire to substitute for the hopper cars certain passenger and freight locomotives, the repairs to which are estimated at \$9,000 per locomotive. This locomotive work would furnish employment to about 1,200 men for four or five months, in the company's shops.

## Railway Employee and Taxpayers Associations

NEW HAMPSHIRE, Rhode Island, Connecticut, Florida, Kansas and Oklahoma are the latest states to establish organizations of railway employees and taxpayers, the purpose of which is solely to encourage patronage of the railways and to secure legislation which will bring competing forms of transportation on a basis of equality in regulation and taxation with the railways. This movement, while first begun about two years ago, has during the past year been expanded to a statewide basis in 29 or more states.

These state organizations recognize fully that the competing forms of trans-

portation have a legitimate field in which they should be unmolested, but it is their desire to have all forms of transportation operate under the same conditions so that traffic will find the mode most economically suited to its requirements. At the present time the railways are handicapped by the heavy restraints placed on them by the I. C. C. and the subsidies enjoyed by their competitors.

The movement enlists not only railway employees, but welcomes also farmers, taxpayers, local truckmen, private motorists, savings bank depositors, life insurance policy holders, and all interested in a community who are harmed by the chaotic competitive conditions now existing in the field of transportation. A start has been made in the formation of a national federation, the chairman of the executive committee of which is H. H. Parker, 106 London street, Portsmouth, Va. Mr. Parker is also president of the railway Employees and Taxpayers Association of Virginia and is a pioneer in the movement.

## Pennsylvania Work-Sharing Plans

W. W. ATTERBURY, president of the Pennsylvania, in a statement issued on October 30, commented on the "Share-the-Work" movement and outlined what has been accomplished along the same lines on the Pennsylvania through the co-operative efforts of employees and the management. General Atterbury's statement follows:

"Representatives of the employees of the Pennsylvania and of the management have just concluded negotiations looking toward the further distribution of available work among all classifications of employment on the railroad. This was accomplished through a series of conferences in which practical plans were perfected for dividing up available work.

"We are about to start work in our shops on building 1,285 new box cars [925 steel box cars and 360 steel automobile cars], and making heavy repairs to other box and gondola cars, which is now possible through the \$2,000,000 'work loan'

just received from the Reconstruction Finance Corporation.

"Heavy freight car repair work assigned to Terre Haute, Ind., shops, to make way at other points for the new equipment, will mean more employment there for approximately 150 shopmen. Similar work assigned to the Mahoningtown shops near New Castle, Pa., will mean increased employment for about 49 additional men in that territory, beginning at once.

"On the basis of working 40 hours a week, the erection of the new box cars will give about 133 additional men employment at Pittsfield Shops, and an equivalent of about 132 additional men at Enola Shops. At our Altoona Works, the new work will amount to an equivalent of about 330 additional men.

"Working each group of employees a lesser number of hours per week would, naturally, result in more shopmen being affected. Our aim is to divide the work so that the greatest possible number of workers may have an opportunity for at least some employment and share in the benefits of the Government's 'work loan.' This will be supervised by the shop officials at each point in a manner which will best meet local conditions.

"The couplers, draft gears, air brakes, castings, doors and the corrugated ends of these new cars will be purchased in the open market. To manufacture them will furnish employment to practically the same number of men in the plants of the railway supply and equipment factories as will be working on the actual erection of the cars in our own shops.

"Material orders are being issued with the utmost dispatch, and erecting the cars will be started immediately on receipt of the material. Some of this is at present under way. We are planning to spread all of this work over a period of between five and six months."

According to a statement made by M. W. Clement, vice-president in charge of operation, work on the fabrication of the raw plates and shapés for the new box cars referred to by Mr. Atterbury began on November 7. The box cars will be of the company's standard construction, but important changes will be made in the construction of the automobile cars. They will be longer, higher and wider. The roofs will be curved somewhat like the "covered wagon" in order to avoid exceeding the clearance dimensions of tunnels and overhead bridges.

A feature to be tried out experimentally in some of the cars is the installation of a permanent device for raising and securing automobiles in an inclined position at each end of the car, to permit also of the loading of additional automobiles standing level on the floor. End doors will be applied on a number of the cars.

(Turn to next left-hand page)



**An addition to Henry Ford's collection**  
Narrow-gauge locomotive of 1892 recently presented to Mr. Ford by Thomas A. Edison. First used in the Edison iron mines at Sparta, N. J., and later at the Portland Cement Works at New Village, N. J.

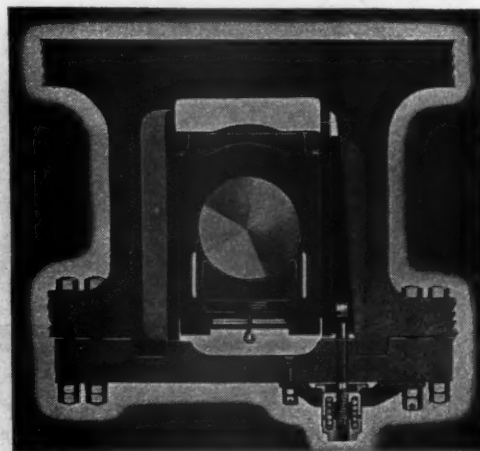
# CONTINUAL WEDGE ADJUSTMENT while running . . .

## KEEPS DOWN REPAIRS



**WEDGE** adjustment by hand finds the mechanic caught between two evils.

« To keep out the slack that soon develops into a battering, bearing destroyer, the wedges must be set up snugly. « But if they are set tight enough to eliminate slack, they may stick when they reach running temperatures. « Continual adjustment of the driving box wedges as the locomotive runs is the solution. « Franklin Wedges automatically adjust themselves with every turn of the driver, providing for expansion as temperatures increase. « They protect the foundation of the locomotive and keep maintenance in check. They help the long runs as nothing else can.



### FRANKLIN RAILWAY SUPPLY COMPANY, Inc.

NEW YORK

CHICAGO

MONTREAL

## Supply Trade Notes

THE HEADLEY EMULSIFIED PRODUCTS COMPANY has moved its executive and sales offices from Philadelphia, Pa., to its plant at Marcus Hook, Pa.

MARK G. MUELLER has been appointed district sales agent in Colorado, New Mexico and western Kansas for the Roller-Smith Company, New York, with headquarters at Denver, Colo.

W. A. TAYLOR has been appointed division manager in charge of the Chicago office of the A. M. Byers Company, Pittsburgh, Pa. Mr. Taylor was formerly assistant manager; he replaces M. G. Henderson, who has resigned.

J. B. WHITENACK, formerly railroad sales representative of JOSEPH T. RYERSON & SON, INC., has been appointed railroad representative of the BRYANT MACHINERY & ENGINEERING COMPANY, Chicago, with headquarters in that city.

J. E. MCFATE, formerly a representative of the Jones & Laughlin Steel Corporation, has been appointed a sales representative of the Republic Steel Corporation, Youngstown, Ohio, with headquarters at Boston, Mass.

H. G. ERB has been appointed district representative for the New England territory of the Double Seal Ring Corporation, with headquarters at Boston, Mass. Mr. Erb formerly handled the development and sale of oil-electric locomotives for the Ingersoll-Rand Company, New York.

THOMAS P. MCGINNIS has been appointed special representative of the ARGYLE RAILWAY SUPPLY COMPANY, Chicago, with headquarters in the Chamber of Commerce building, Pittsburgh, Pa., and will cover the Pittsburgh and Cleveland territories.

RAYMOND O. YOUNG, who has been associated with the central organization of the Hale & Kilburn Company, Philadelphia, Pa., for many years in engineering and sales capacities, has been appointed

western sales manager, with headquarters in the McCormick building, Chicago, to succeed H. B. Gengenbach, who has resigned.

THOMAS P. MCGINNIS has been appointed representative of The Locomotive Finished Material Company, Atchison, Kan. Mr. McGinnis will have his headquarters in the Chamber of Commerce Building, Pittsburgh, Pa., and will cover the Pittsburgh and eastern Ohio territory.

THE SELLING ARRANGEMENT reported in the October *Railway Mechanical Engineer* between the Peerless Equipment Company of New York and Chicago, and the Hennessy Lubricator Company, New York, has been abandoned, and all communications pertaining to Hennessy lubricators should be addressed to the Hennessy Lubricator Company at 75 West street, New York.

THE MARLIN-ROCKWELL CORPORATION, manufacturers of ball bearings, Jamestown, N. Y., recently consolidated the sales activities formerly carried on independently by the following subsidiary companies: Gurney Ball Bearing division, Jamestown, N. Y., Standard Steel & Bearings Incorporated, Plainville, Conn., and Strom Bearings Company, Chicago. The bearings manufactured by all of the above companies are now available through the corporation's sales organization at Jamestown, N. Y., with eastern district sales office at Plainville, Conn., western district sales office at Chicago, and branch sales offices at Detroit, Mich., Cincinnati, Ohio, Cleveland, Los Angeles, Cal., San Francisco, and New York City.

THE COOLING & AIR CONDITIONING CORPORATION, founded by and until recently, partly owned by the B. F. Sturtevant Company, Hyde Park, Boston, Mass., is now a completely owned Sturtevant subsidiary, to be incorporated under the laws of Massachusetts. The name of the corporation will be changed to Sturtevant-Cooling & Air Conditioning Company, with headquarters at Hyde Park. The officers include E. B.

Freeman, president, B. S. Foss, treasurer, and H. R. Sewell, vice-president and general manager, who has been with the Sturtevant Company for 17 years, the past seven as manager of the air conditioning division. The B. F. Sturtevant Company will handle, through the regular trade channels, the manufacturing and sale of the unit type of air-conditioning product, such as coolers, humidifiers, or combinations of both.

### Obituary

SAMUEL LEWIS SMITH, vice-president of the National Malleable & Steel Castings Company, who died suddenly at his home in Cleveland, Ohio, on October 6, was born in Cleveland, on August 22, 1867. Following his graduation from Phillips Academy at Andover, Mass., he entered Yale University and was graduated in 1889, after which he became connected with the Eberhard Manufacturing Company, Cleveland. In 1891 he became associated with the National Malleable & Steel Castings Company, in which organization he progressed steadily until he was made a director in 1908, and vice-president in charge of sales in 1911. At the time

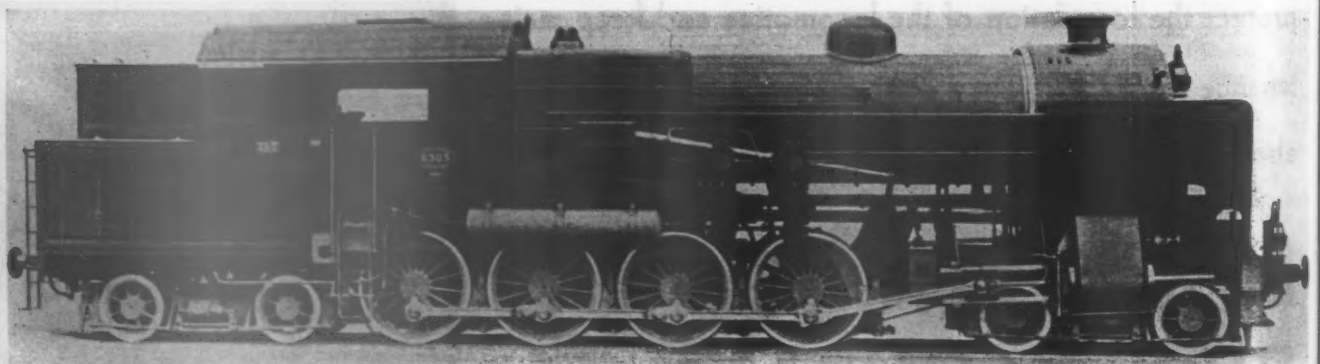


Samuel Lewis Smith

of his death he was a director of the National Industrial Conference Board and an executive member of the Railway Business Association.

(Turn to next left-hand page)

\* \* \*



Tank 4-8-4 type locomotive on the Dutch State Railway

Diameter of drivers, 61 in. Cylinders, diameter and stroke, (four cylinders) 16½ in. by 26 in. Boiler pressure, 207 lb. Tractive force, 32,400 lb.



## READY FOR BUSINESS

Increased tonnage—that sure index  
of greater production and better times  
—will soon be moving.



The roads that have ready a large  
percentage of strictly modern power will  
be best prepared to handle the increase  
promptly and to the satisfaction of  
shippers. An increase in net earnings  
will surely follow.

*It takes Modern Locomotives to make money these days!*

**THE BALDWIN LOCOMOTIVE WORKS**  
**PHILADELPHIA**

# Personal Mention

## General

**WILLIAM JACOB** has been appointed mechanical engineer of the Pere Marquette, with headquarters at Detroit, Mich. The office of master car builder previously held by Mr. Jacob has been abolished.

**W. WALKER**, locomotive foreman on the Canadian National at Saskatoon, Sask., has been appointed acting superintendent of motive power and car equipment of the Alberta district, with headquarters at Edmonton, Alta.

**S. J. HUNGERFORD**, acting president of the Canadian National, has been elected president of the Central Vermont and president of the Grand Trunk Western, a subsidiary of the Canadian National, to succeed Sir Henry Thornton, who resigned these positions sometime ago. Mr. Hungerford was born on July 16, 1872, near Bedford, Que., and received a high school education. He entered railway service in 1886 as a machinist apprentice on the Canadian Pacific at Farnham, Que. From 1891 to 1897 he served as a machinist at various points in Quebec, Ontario, and Vermont. From 1897 to 1900 he was assistant foreman at Farnham, Que., and during the latter year was promoted to locomotive foreman at Megantic, Que. From 1901 to 1903 he served in a similar capacity at Cranbrook, B. C. In 1903 he was appointed master mechanic at Calgary, Alta., and in 1907 was promoted to superintendent of locomotive shops at Winnipeg. Seven years later he became superintendent of Western Lines of the Canadian Northern (now part of the C. N. R.), at Winnipeg, Man. A month later he was appointed superintendent



S. J. Hungerford

ent of rolling stock of the entire system with headquarters at Toronto. In 1917, he was advanced to general manager of the Eastern Lines with headquarters at Toronto, and in 1918 was appointed assistant vice-president of the Canadian National. In 1920 Mr. Hungerford was appointed vice-president in charge of operation, and in 1923 was given charge of operation and maintenance of the entire

system, holding that position until his recent election as acting president.

**W. E. BARNES**, general superintendent of motive power of the Atlantic Region of the Canadian National, has had his jurisdiction extended to include the car department, and his title has been changed to general superintendent of motive power and car equipment. Mr. Barnes was born at Shediac, N. B., in 1878. He became an apprentice draftsman on the Intercolonial Railway in 1899; in 1902, a draftsman, and in 1906, a machinist apprentice. In 1909 he returned to the position of draftsman; in 1910, was appointed locomotive and enginehouse inspector, and in 1911, acting master mechanic. He was appointed to the position of master mechanic in 1913 and in January, 1918, became general master mechanic. In December, 1918, he was appointed master mechanic of the Maritime Division, with the amalgamation of the Canadian Government Railways and the Canadian National. He became superintendent of motive power of the Atlantic Region of the Canadian National in 1923 and in 1928 was appointed general superintendent of motive power.

## Master Mechanics and Road Foremen

**B. H. SMITH**, master mechanic of the Chicago, Rock Island & Pacific at Dalhart, Tex., has been transferred to the position of master mechanic at Little Rock, Ark.

**R. L. BLACK**, master mechanic of the Redford division of the Norfolk & Western, has had his jurisdiction extended to include the Shenandoah division.

**E. G. HASKINS**, master mechanic on the Denver & Rio Grande Western, with headquarters at Grand Junction, Colo., has retired after 50 years' service with that road.

**E. RAITT**, assistant master mechanic of the Atchison, Topeka & Santa Fe, at Prescott, Ariz., has been transferred to the San Francisco Terminal division, with headquarters at Richmond, Cal.

**J. C. COLE**, master mechanic of the Oklahoma-Southern division of the Chicago, Rock Island & Pacific at Chickasha, Okla., has been transferred to the Missouri division with headquarters at Trenton, Mo.

**J. A. SHEEDY**, superintendent of motive power of the Southwestern division of the Pennsylvania, with headquarters at Indianapolis, Ind., has been appointed master mechanic, with the same headquarters, succeeding C. G. Brown, Jr.

**A. HAMBLETON**, general foreman in the locomotive department of the Chicago, Rock Island & Pacific at Shawnee, Okla., has been promoted to the position of master mechanic, with headquarters at Armourdale, Kan.

**W. C. SMITH**, master mechanic of the Illinois division of the Missouri Pacific and the Missouri-Illinois Railroad, with headquarters at Dupon, Ill., has had his jurisdiction extended to include the Missouri division.

**C. L. SHARP**, master mechanic of the Chicago, Rock Island & Pacific at Little Rock, Ark., has been transferred to the position of master mechanic at Dalhart, Texas.

**J. A. CONLEY**, master mechanic of the Valley division of the Atchison, Topeka & Santa Fe, with headquarters at Calwa, Cal., has had his jurisdiction extended to include the San Francisco Terminal division, succeeding E. F. Callaher, deceased.

**F. H. MURRAY**, district master mechanic, Eastern district, of the Erie has been transferred from Hornell, N. Y., to Jersey City, N. J., and the position of assistant district master mechanic of the Eastern district has been abolished.

**ELMER A. KUHN** has been appointed master mechanic of the Canadian Division of the Pere Marquette, with headquarters at St. Thomas, Ont. Mr. Kuhn was born at East Radford, Va. He received his early education in the public and high schools of Hamilton, Ont. After finishing high school, he served a machinist apprenticeship at the Hamilton, Ont., shops of the Toronto, Hamilton & Buffalo. Mr. Kuhn graduated from University of Pittsburgh with a degree of Bachelor of Science in railway mechanical engineering. In June, 1920, Mr. Kuhn entered the service of the New York, Chicago & St. Louis at Cleveland, Ohio, serving, between then and 1929 on special mechanical department work, as assistant enginehouse foreman at Conneaut, Ohio, and engineer of motive power at Cleveland. In November, 1929, he was appointed assistant engineer of motive power for the Advisory Mechanical Committee of the Chesapeake & Ohio, Erie, New York, Chicago & St. Louis and the Pere Marquette, which position he held at the time of his present appointment.

## Car Department

**O. H. HAGEN** has been re-appointed to his former position as superintendent of the steel car plant of the Chicago, Burlington & Quincy at Galesburg, Ill. The plant was reopened on September 1 after having been shut down since March 1. Since the closing of the plant, Mr. Hagen had been in charge of the repair tracks at Galesburg.

**H. H. HARVEY**, general car foreman on the Chicago, Burlington & Quincy, at Chicago, who has been on a leave of absence since late in 1931, has resumed his duties, displacing N. J. BRICHER, acting general car foreman, who has returned to his former position as general foreman at the Aurora (Ill.) shops of the Burlington.

**WILLIAM GOUGE**, superintendent of car shops of the Canadian National at London, Ont., has been transferred to the position of superintendent of car shops at Leaside, Ont. Mr. Gouge was born in Kent, England, in 1880, and began railway work at Leaside as a carpenter in 1919. Within a few months he was promoted to the posi-

tion of lead hand carpenter and in 1920 became freight car foreman. In 1926 he was appointed repair track foreman; in 1927, traveling car inspector; in 1928, passenger car foreman; in 1930, superintendent of car shops at Leaside, and in 1931, superintendent of car shops at London. On August 1 of this year he was transferred back to Leaside.

W. H. TOWNER, superintendent of car shops of the Canadian National at Leaside, Ont., has retired after more than 50 years of service. Mr. Towner became an apprentice at the Stratford, Ont., shops of the Canadian National in 1882 and in 1887 became a fitter. During 1898 and 1899 he worked at Windsor, Ont., and Niagara Falls, and in 1900 became locomotive foreman at Hamilton. In this capacity he worked at Hamilton, St. Thomas and Sarnia, moving to Belleville, Ont., in 1911. In 1917 he was appointed general foreman at Belleville; in 1923, enginehouse inspector of the Montreal district; in 1926, assistant superintendent of motive power at Toronto, Ont., and in July, 1931, superintendent of the Leaside car shops.

T. M. HYMAN, assistant general superintendent of car equipment of the Canadian National at Toronto, has been appointed superintendent of car shops, with headquarters at London, Ont. Mr. Hyman entered the employ of the Canadian National in 1910 as a carpenter. He became an inspector at Montreal in 1913 and after his return from war service was appointed assistant foreman and later foreman in the car department. In 1920 he was transferred to London as master car builder, after a few months returning to Montreal as inspector. Later he became master car builder at Montreal and in March, 1923, was appointed superintendent of the car shops. In 1925 he was transferred to Toronto as assistant general superintendent of car equipment.

G. E. MCCOY, general superintendent of car equipment of the Atlantic Region of the Canadian National at Moncton, N. B., has been appointed assistant general superintendent of car equipment, Central Region, with headquarters at Toronto, Ont. Mr. McCoy was born at Moncton, N. B., in 1886. He became a machinist and apprentice draftsman in the employ of the I. C. R. in 1900 and in 1916 became assistant chief draftsman of the Canadian Government Railways. Later in the same year he was appointed assistant master car builder at Moncton, and in 1918 was appointed master car builder. He became superintendent of car equipment, Atlantic Region, of the Canadian National in 1923 and general superintendent of car equipment in 1928.

### Shop and Enginehouse

A. R. RUITER, master mechanic of the Chicago, Rock Island & Pacific at Armourdale, Kan., has been appointed general foreman in the locomotive department with headquarters at Shawnee, Okla.

### Purchases and Stores

H. M. SMITH, assistant general storekeeper of the Northern Pacific, has been promoted to general storekeeper, succeeding Edwin J. Myers, who has retired after nearly 43 years of continuous service with this company.

C. A. NICHOLS, traveling storekeeper, has been promoted to assistant general storekeeper to succeed Mr. Smith. The headquarters of Mr. Smith and Mr. Nichols will be as before, at St. Paul, Minn.

H. G. DEVINE, assistant to the purchasing officer of the St. Louis Southwestern, with headquarters at St. Louis, Mo., has been promoted to purchasing agent, with the same headquarters to succeed E. O. Griffin, assistant to the president in charge of purchases and stores, who died on September 15.

### Obituary

H. L. CAMPBELL, master mechanic on the Gulf, Mobile & Northern, with headquarters at Louisville, Miss., died on September 20 at his home in that city.

GEORGE W. BICHLMEIR, general purchasing agent of the Union Pacific system, with headquarters at Omaha, Neb., died on October 23, after an illness of five weeks. Mr. Bichlmeir had been in railway service continuously for 28 years. He was born on September 10, 1886, at Cincinnati, Ohio, and entered railway service in September, 1904, as an office boy on the Cincinnati, Hamilton & Dayton (now part of the Baltimore & Ohio), where he remained until December of the same year, when he went with the Pere Marquette as a clerk in the purchasing department at the same place. From March, 1906, until April, 1907, Mr. Bichlmeir served as a statistician for the Pere Marquette at Cincinnati, and from October to December, 1908, he served as a laborer, warehouseman and shipping clerk in the supply department of the Missouri Pacific at St. Louis, Mo. During the following year he held the positions of timekeeper, assistant accountant and accountant in the supply department at the same place. In December, 1909, Mr. Bichlmeir went with the Kansas City Southern as an accountant at Pittsburg, Kan., returning to the Missouri Pacific a few months later as chief clerk at Osawatimie, Kan. In January, 1911, he was appointed chief clerk to the general storekeeper of the Kansas City Southern at Pittsburg, and seven years later he was promoted to chief clerk to the purchasing agent, at Kansas City, Mo., being further advanced to assistant purchasing agent with the same headquarters on August 3, 1918. Two years later Mr. Bichlmeir was promoted to purchasing agent of the Kansas City Southern. On November 15, 1920, he severed his connection with this road to become purchasing assistant on the staff of the president of the Union Pacific System, with headquarters at Omaha, Neb. On January 1, 1922, he was appointed general purchasing agent of the system with the same headquarters.

### Trade Publications

*Copies of trade publications described in the column can be obtained by writing to the manufacturers. State the name and number of the bulletin or catalog desired, when mentioned in the description.*

**AUTOMATIC SEPARATORS.**—The principle of operation and advantages of Swendeman automatic separators for eliminating oil and water from compressed air lines, are described in Catalog A issued by the Leavitt Machine Company, Orange, Mass.

**VENTILATING FANS.**—The L. J. Wing Manufacturing Company, 154 West Fourteenth street, New York, describes and illustrates in Bulletin F-5 Wing safety ventilating fans for offices, shops, factories, etc.

**COLLOIDAL - GRAPHITED LUBRICANTS.**—Technical Bulletin No. 92.4 pertaining to colloidal-graphited lubricants has been issued by the Acheson Oilday Company, Port Huron, Mich. Bulletin No. 200.2 discusses the mechanics of lubrication with colloidal graphite.

**VALVELESS AUTOMATIC CONTROLLERS.**—Bulletin 1010, issued by the Johnston Manufacturing Company, Minneapolis, Minn., describes the basic principle and operation of the Johnston line of valveless automatic controllers for atmosphere and temperature in oil-burning furnaces.

**BLAW-KNOX DUST COLLECTOR.**—"Positive Dust Collection at Low Cost" is the title of the 16-page illustrated catalog issued by the Blaw-Knox Company, Pittsburgh, Pa., describing Blaw-Knox framed bag dust collectors for general industrial application.

**THREADING MACHINERY.**—The Landis Machine Company, Waynesboro, Pa., has issued a new catalog describing Landmaco threading machines, Landis standard threading machines and Landis automatic forming and threading machines.

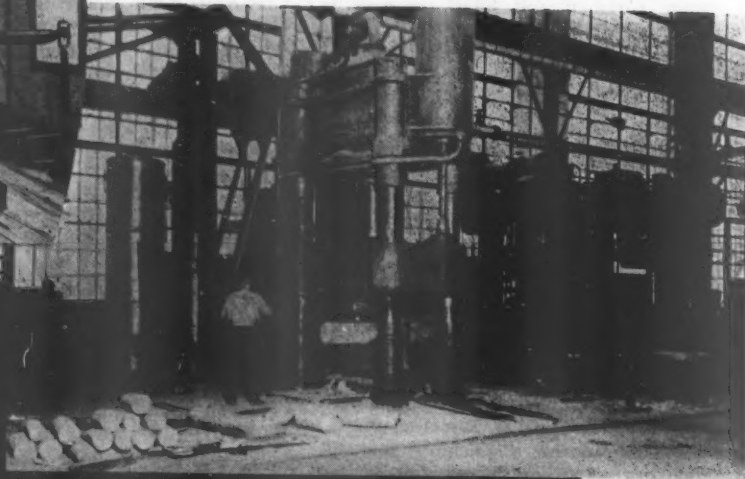
**WATER SOFTENERS.**—"No Scale, No Sludge, No Mud—The application of Zeolite Water Softeners to the treatment of Boiler Feed Waters" is the title of an interesting 36-page booklet published by the Permutit Company, 440 Fourth avenue, New York. It is profusely illustrated with photographs and diagrams and contains tabulated data, conversion tables, factors, reactions, etc.

**AIR FILTERS.**—The American Air Filter Company, Inc., 215 Central avenue, Louisville, Ky., describes in the various chapters of its 26-page catalog, entitled "American Air Filters in Industry," filtered air in atmospheric dust control; filtered air for industrial air conditioning, industrial ventilation, drying operations, product finishing; for control of bacteria and mold spores; for cooling electrical equipment; for the protection of engines and compressors, and for miscellaneous industrial applications.

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